COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DRAFT* PERMIT *April 30, 2019
TO WITHDRAW GROUNDWATER IN THE
EASTERN SHORE GROUNDWATER MANAGEMENT AREA

Permit Number: GW0074900
Effective Date: Mo Dy, 2019
Expiration Date: Mo Dy, 2034

Pursuant to Section 62.1-256 of the Ground Water Management Act of 1992 (Chapter 25, Title 62.1 of the Code of Virginia) and the Groundwater Withdrawal Regulations (Regulations) (9VAC25-610-10 *et seq*.), the State Water Control Board (Board) hereby authorizes the Permittee to withdraw and use groundwater in accordance with this permit.

Permittee Le Ung and Mark McCready

Facility Seaside Poultry Farm

Facility Address 36558 Seaside Road

Belle Haven, VA 23306

The Permittee's authorized groundwater withdrawal shall not exceed:

10,000,000 gallons per year,
2,500,000 gallons per month,

The permitted withdrawal will be used to provide an agricultural water supply. Other uses are not authorized by this permit.

The Permittee shall comply with all conditions and requirements of the permit.

By direction of the State Water Control Board, this Permit is granted by:

Signed_____ Date _____

Director, Office of Water Supply

This permit is based on the Permittee's application submitted on December 19, 2017, and subsequently amended to include supplemental information provided by the Permittee. The following are conditions that govern the system set-up and operation, monitoring, reporting, and recordkeeping pertinent to the Regulations.

Part I
Operating Conditions

A. Authorized Withdrawal

1. The withdrawal of groundwater shall be limited to the following wells identified in the table below. Withdrawals from wells not included in Table 1 are not authorized by this permit and are therefore prohibited. 9VAC25-610-140.A

Table 1

Owner Well Name	DEQ Well #	Well Depth (ft)	Screen Intervals	Aquifer	Latitude	Longitude	Datum
Well 1	100-01462	235	220-235	Middle Yorktown-Eastover	37° 32' 39.96"	-75° 47' 51.71"	WGS84
Well 2	100-01463	235	215-235	Middle Yorktown-Eastover	37° 32' 39.60"	-75° 47' 52.55"	WGS84
Well 3	100-01464	235	220-235	Middle Yorktown-Eastover	37° 32' 39.11"	-75° 47' 53.95"	WGS84
Well 4	100-01465	235	215-235	Middle Yorktown-Eastover	37° 32' 38.64"	-75° 47' 55.18"	WGS84
Well 5	100-01466	235	220-235	Middle Yorktown-Eastover	37° 32' 33.48"	-75° 47' 44.42"	WGS84
Well 6	100-01467	235	220-235	Middle Yorktown-Eastover	37° 32' 33.04"	-75° 47' 45.20"	WGS84
Well 7	100-01468	235	220-235	Middle Yorktown-Eastover	37° 32' 32.22"	-75° 47' 46.66"	WGS84
Well 8	100-01469	235	220-235	Middle Yorktown-Eastover	37° 32' 31.76"	-75° 47' 47.59"	WGS84

2. Any actions that result in a change to the well operation, construction, or pump intake setting of wells included in this permit must be pre-approved by the Department of Environmental Quality (Department) in writing prior to implementing the change and a revised GW-2 Form must be submitted to the Department within 30 days after the physical construction of a well is altered or the pump intake setting has been changed. If changes are a result of an emergency, notify the Department within 5 days from the change. 9VAC25-610-140.C

B. Pump Intake Settings

1. The Permittee shall not place a pump or water intake device lower than the top of the uppermost confined aquifer that a well utilizes as a groundwater source or lower than the bottom of an unconfined aquifer that a well utilizes as a groundwater source in order to prevent dewatering of the aquifer, loss of inelastic storage, or damage to the aquifer from compaction. 9VAC25-610-140.A.6

2. Pump settings in individual wells are limited as follows. Any change in the pump setting must receive prior approval by the Department.

Owner Well Name	DEQ Well #	Max Pump Setting (feet below land surface)*
Well 1	100-01462	210
Well 2	100-01463	210
Well 3	100-01464	210
Well 4	100-01465	210
Well 5	100-01466	210
Well 6	100-01467	210
Well 7	100-01468	210
Well 8	100-01469	210

C. Reporting

1. Water withdrawn from each well shall be recorded consistently at the end of each month and reported to the Office of Water Supply, in paper or electronic format, on a form provided by the Department by the tenth (10^{th}) day of each January, April, July and October for the respective previous calendar quarter. Records of water use shall be maintained by the Permittee in accordance with Part III.F, 1 through 5 of this permit.9VAC25-610-140.A.9

2. The Permittee shall report any amount in excess of the permitted withdrawal limit by the fifth (5th) day of the month following the month when such a withdrawal occurred. Failure to report may result in compliance or enforcement activities. 9VAC25-610-140.C

3. The following is a summary of reporting requirements for specific facility wells:

Owner Well Name	DEQ Well #	Reporting Requirements
Well 1	100-01462	Water Use
Well 2	100-01463	Water Use
Well 3	100-01464	Water Use
Well 4	100-01465	Water Use
Well 5	100-01466	Water Use
Well 6	100-01467	Water Use
Well 7	100-01468	Water Use
Well 8	100-01469	Water Use

D. Water Conservation and Management Plan

1. The Water Conservation and Management Plan (WCMP) submitted in the application received (June 18, 2018) and subsequently amended and then approved by the Department is incorporated by reference into this permit and shall have the same effect as any condition contained in this permit and may be enforced as such.

2. By the end of the first year of the permit cycle (Mo Dy, 2020) the Permittee shall submit a detailed description of their leak detection and repair program activities and documentation to the Department that these activities have been conducted. This documentation shall include frequency of the activities completed and the findings and results of the activities during the first year of the permit term. 9VAC25-610-100.B.1.b,2.b,or 3.b

3. As soon as completed but not later than the end of the second year of the permit cycle (Mo Dy, 2021), the Permittee shall submit to the Department results of a 12 month audit of the total amount of groundwater used in the distribution system and the separate amounts used for drinking and cooling. This audit report shall include the flock cycle start and end dates during the year, and any necessary changes to the leak detection and repair program or operations that affected water use. 9VAC25-610-100.B.1.b,2.b,or 3.b

4. A report on the plan's effectiveness in maintaining or reducing water use and a summary of proposed revisions to the WCMP to address any elements that can be improved based on operations to date shall be submitted by the end of years five (Mo Dy, 2024) and ten (Mo Dy, 2029) of the permit term. These reports shall include as appropriate: 9VAC25-610-140.C

    a. Any new water saving equipment installed or water saving processes adopted;
    b. A summary of the operation of the cooling system for the houses during the report period including what months the cooling system was operated;
    c. Evaluation of the leak detection and repair program with a summary of any significant leaks found and repaired; and
    d. A summary of the flock cycles and overall water use patterns for each year covered by the report.

5. If revisions or additions to the plan are necessary an updated WCMP shall be submitted to the Department for approval along with the report prior to implementation of the revised plan

6. Records of activities conducted pursuant to the WCMP are to be submitted to DEQ upon request.

E. Well Tags

1. Each well that is included in this permit shall have affixed to the well casing, in a prominent place, a permanent well identification plate that records, at a minimum, the DEQ well identification number, the groundwater withdrawal permit number, the total depth of the well, and the screened intervals in the well. Such well identification plates shall be in a format specified by the Board and are available from the Department. 9VAC25-610-140.A.12

2. Well tags shall be affixed to the appropriate well casing within 30 days of receiving the tags from the Department. The accompanying well tag installation certification form shall be returned to the Department within 60 days of receipt of the tags. 9VAC25-610-140.C

Part II
Special Conditions

Pursuant to 9VAC25-610-140.B and C, the following Special Conditions apply to this permit in order to protect the public welfare, safety, and health or conserve, protect and help ensure the beneficial use of groundwater.

A. Meter Installation Verification/Correction

If notified by DEQ through an inspection report that meters meeting the requirements set forth in Part III Condition I of this permit have not been correctly installed on each production well in such a manner as to record total withdrawals from the well including both cooling water and drinking water, the Permittee shall correct any identified meter issues within 60 days of notification.

Part III
General Conditions

A. Duty to Comply

The Permittee shall comply with all conditions of the permit. Nothing in this permit shall be construed to relieve the permit holder of the duty to comply with all applicable federal and state statutes, regulations and prohibitions. Any permit violation is a violation of the law and is grounds for enforcement action, permit termination, revocation, modification, or denial of a permit application. 9VAC25-610-130.A

B. Duty to Cease or Confine Activity

It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to halt or reduce the activity for which a permit has been granted in order to maintain compliance with the conditions of the permit. 9VAC25-610-130.B

C. Duty to Mitigate

The Permittee shall take all reasonable steps to avoid all adverse impacts that may result from this withdrawal as defined in 9VAC25-610-10 and provide mitigation of the adverse impact when necessary as described in 9VAC25-610-110.D.3.g. 9VAC25-610-130.C

D. Inspection, Entry, and Information Requests

Upon presentation of credentials, the Permittee shall allow the Board, the Department, or any duly authorized agent of the Board, at reasonable times and under reasonable circumstances, to enter upon the Permittee's property, public or private, and have access to, inspect and copy any records that must be kept as part of the permit conditions, and to inspect any facilities, well(s), water supply system, operations, or practices (including sampling, monitoring and withdrawal) regulated or required under the permit. For the purpose of this section, the time for inspection shall be deemed reasonable during regular business hours. Nothing contained herein shall make an inspection time unreasonable during an emergency. 9VAC25-610-130.D

E. Duty to Provide Information

The Permittee shall furnish to the Board or Department, within a reasonable time, any information that the Board may request to determine whether cause exists for modifying or revoking, reissuing, or terminating the permit, or to determine compliance with the permit. The Permittee shall also furnish to the Board or Department, upon request, copies of records required to be kept by regulation or this

permit. 9VAC25-610-130.E

F. Monitoring and Records Requirements

1. The Permittee shall maintain a copy of the permit on-site and/or shall make the permit available upon request. 9VAC25-610-130.E

2. Monitoring of parameters shall be conducted according to approved analytical methods as specified in the permit. 9VAC25-610-130.F.1

3. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. 9VAC25-610-130.F.2

4. The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart or electronic recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit, for a period of at least three years from the date of the expiration of a granted permit. This period may be extended by request of the Board at any time. 9VAC25-610-130.F.3

5. Records of monitoring information shall include as appropriate: 9VAC25-610-130.F.4

    a. the date, exact place and time of sampling or measurements;

    b. the name(s) of the individual(s) who performed the sampling or measurements;

    c. the date the analyses were performed;

    d. the name(s) of the individual(s) who performed the analyses;

    e. the analytical techniques or methods supporting the information, such as observations,

    f. readings, calculations and bench data used;

    g. the results of such analyses; and

    h. chain of custody documentation.

G. Environmental Laboratory Certification

The Permittee shall comply with the requirement for certification of laboratories conducting any tests, analyses, measurements, or monitoring required pursuant to the State Water Control Law (§ 62.1-44.2 et seq.), Environmental Laboratory Certification Program (§ 2.2-1105et seq.), Certification for Noncommercial Environmental Laboratories (1VAC30-45), and/or Accreditation for Commercial Environmental Laboratories (1VAC30-46), and

    a. Ensure that all samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

b. Conduct monitoring according to procedures approved under 40CFR Part 136 or alternative methods approved by the U.S. Environmental Protection Agency.

c. Periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals that will ensure accuracy of measurements. (1VAC30-45-20)

H. Future Permitting Actions

1. A permit may be modified or revoked as set forth in Part VI of the Regulations. 9VAC25-610-290 and 9VAC25-610-130.G

2. If a Permittee files a request for permit modification or revocation, or files a notification of planned changes, or anticipated noncompliance, the permit terms and conditions shall remain effective until the Board makes a final case decision. This provision shall not be used to extend the expiration date of the effective permit. 9VAC25-610-130.G

3. Permits may be modified or revoked upon the request of the Permittee, or upon Board initiative, to reflect the requirements of any changes in the statutes or regulations. 9VAC25-610-130.G

4. The Permittee shall schedule a meeting with the Department prior to submitting a new, expanded or modified permit application. 9VAC25-610-85

5. A new permit application shall be submitted 270 days prior to the expiration date of this permit, unless permission for a later date has been granted by the Board, to continue a withdrawal greater than or equal to 300,000 gallons in any month while an application for a renewal is being processed. 9VAC25-610-96

6. A new permit application shall be submitted 270 days prior to any proposed modification to this permit that will (i) result in an increase of withdrawal above permitted limits; or (ii) violate the terms and conditions of this permit. 9VAC25610-96

7. The applicant shall provide all information described in 9VAC25-610-94 for any reapplication. 9VAC25-610-96.C

8. The Permittee must notify the Department in writing of any changes to owner and facility contact information within 30 days of the change. 9VAC25-610-140.C

I. Metering and Equipment Requirements

1. Each well and/or impoundment or impoundment system shall have an in-line totalizing flow meter to read gallons, cubic feet, or cubic meters installed prior to beginning the permitted use. Meters shall produce volume determinations within plus or minus 10% of actual flows. 9VAC25-610-140.A.7.b

   a. A defective meter or other device must be repaired or replaced within 30 days.

   b. A defective meter is not grounds for not reporting withdrawals. During any period when a meter is defective, generally accepted engineering methods shall be used to estimate

withdrawals. The period during which the meter was defective must be clearly identified in the groundwater withdrawal report required by Part I, Subsection D of this permit. An alternative method for determining flow may be approved by the Board on a case-by-case basis.

2. Each well shall be equipped in a manner such that water levels can be measured during pumping and non-pumping periods without dismantling any equipment. Any opening for tape measurement of water levels shall have an inside diameter of at least 0.5 inches and be sealed by a removable plug or cap. The Permittee shall provide a tap for taking raw water samples from each permitted well. 9VAC25-610-140.A.7.e

J. Minor Modifications

1. A minor modification to this permit must be made to replace an existing well(s) or add an additional well(s) provided that the well(s) is screened in the same aquifer(s) as the existing well(s), and is in the near vicinity of the existing well(s), the total groundwater withdrawal does not increase, the area of impact does not increase, and the well has been approved by the Department prior to construction. 9VAC25-610-330.B.4 and 5

2. A minor modification to this permit must be made to combine withdrawals governed by multiple permits when the systems are physically connected as long as interconnection will not result in additional groundwater withdrawal and the area of impact will not increase. 9VAC25-610-330.B.6

3. Minor modifications to this permit must also be made to:

    a. Change an interim compliance date up to 120 days from the original compliance date, as long as the change does not interfere with the final compliance date. 9VAC25-610-330.B.7

    b. Allow for change in ownership when the Board determines no other change in the permit is necessary and the appropriate written agreements are provided in accordance with the transferability of permits and special exceptions. 9VAC25-610-320 and 9VAC25-610-330.B.8

    c. Revise a Water Conservation and Management Plan to update conservation measures being implemented by the Permittee that increase the amount of groundwater conserved. 9VAC25-610-330.B.9

K. Well Construction

At least 30 days prior to the scheduled construction of any well(s), the Permittee shall notify the Department of the construction timetable and receive prior approval of the well(s) location(s) and acquire the DEQ Well number. All wells shall be constructed in accordance with the following requirements.

1. A well site approval letter or well construction permit must be obtained from the Virginia Department of Health prior to construction of the well. 9VAC25-610-130.A

2. A complete suite of geophysical logs (Spontaneous Potential, Single Point Resistance, 16/64 Short

and Long Normal, Natural Gamma) shall be completed for the well and submitted to the Department along with the corresponding completion report. 9VAC25-610-140.C

3. The Permittee shall evaluate the geophysical log and driller's log information to estimate the top of the target aquifer and; therefore, a depth below which the pump shall not be set. The Permittee's determination of the top of the target aquifer shall be submitted to the Department for review and approval, or approved on site by the Department's Groundwater Characterization staff, prior to installation of any pump. 9VAC25-610-140.A.6

4. The Permittee shall install gravel packs and grout in a manner that prevents leakance between aquifers. Gravel pack shall be terminated close to the top of the well screen(s) and shall not extend above the top of the target aquifer. 9VAC25-610-140.C

5. A completed GW-2 Form and any additional water well construction documents shall be submitted to the Department within 30 days of the completion of any well and prior to the initiation of any withdrawal from the well. 9VAC25-610-140.C. The assigned DEQ Well number shall be included on all well documents. 9VAC25-610-140.C

6. In addition to the above requirements, construction of a Water Level Monitoring State Observation Well (SOW) requires:

    a. The Permittee shall coordinate activities with the Department's Groundwater Characterization Program (GWCP) to determine the appropriate observation well location and construction schedule, along with the needed screen interval(s), and other completion details following review of geophysical logging. 9VAC25-610-140.C

    b. Prior to preparation of bid documents for construction of the observation well, the Permittee shall notify the Department and shall include any GWCP requirements in the bid documents. At a minimum, the Department will require a pre-bid meeting with interested drilling contractors and a pre-construction meeting with the successful bidder. 9VAC25-610-140.C

    c. Instrumentation to meet the requirements for real-time data transmission consistent with the State Observation Well Network shall be purchased by the Permittee. The Permittee shall submit a purchase order based on the Department's equipment specifications for review and approval prior to purchase of the equipment. The Permittee shall not be required to install the equipment. 9VAC25-610-140.C

7. In addition to the above requirements, construction of a Chloride Monitoring SOW requires:

    a. The Permittee shall coordinate activities with the Department's Groundwater Characterization Program (GWCP) to determine the appropriate observation well location and construction schedule, along with the needed screen interval(s), and other completion details following review of geophysical logging. 9VAC25-610-140.C

    b. Prior to preparation of bid documents for construction of the observation well, the Permittee shall notify the Department and shall include any GWCP requirements in the bid documents. At a minimum, the Department will require a pre-bid meeting with interested drilling contractors and a pre-construction meeting with the successful bidder. 9VAC25-610-140.C

c. Instrumentation to meet the requirements for real-time data transmission consistent with the State Observation Well Network shall be purchased by the Permittee. The Permittee shall submit a purchase order based on the Department's equipment specifications for review and approval prior to purchase of the equipment. The Permittee shall not be required to install the equipment. 9VAC25-610-140.C

d. Instrumentation to meet the requirements for continuous measurement of specific conductance from multiple levels within the well screen shall be purchased by the Permittee. The Permittee shall submit a purchase order based on the Department's equipment specifications for review and approval prior to purchase of the equipment. The Permittee shall not be required to install the equipment. 9VAC25-610-140.C

L. Permit Reopening

This permit may be reopened for the purpose of modifying the conditions of the permit as follows:

a. To meet new regulatory standards duly adopted by the Board. 9VAC25-610-140.A.11

b. When new information becomes available about the permitted withdrawal, or the impact of the withdrawal, which had not been available at permit issuance and would have justified the application of different conditions at the time of issuance. 9VAC25-610-310.B.1

c. When the reported withdrawal is less than 60% of the permitted withdrawal amount for a five year period. 9VAC25-610-310.B.2

d. If monitoring information indicates the potential for adverse impacts to groundwater quality or level due to this withdrawal. 9VAC25-610-140.C

COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMIT ISSUANCE FACT SHEET

Groundwater Withdrawal Permit Number: GW0074900
Application Date: December 19, 2017

The Department of Environmental Quality (Department or DEQ) has reviewed the application for a Groundwater Withdrawal Permit. Based on the information provided in the application and subsequent revisions, DEQ has determined that there is a reasonable assurance that the activity authorized by the permit is a beneficial use as defined by the regulations. Groundwater impacts have been minimized to the maximum extent practicable. The following details the application review process and summarizes relevant information for developing the Permit and applicable conditions.

Permittee / Legal Responsible Party

Name & Address:	Le Ung 30472 Plantation Drive Princess Anne, MD 21853
Phone:	(443) 286-6835

Facility Name and Address

Name & Address:	Seaside Poultry Farm 36558 Seaside Rd Belle Haven, VA 23306
Phone:	(410) 924-6662

Contact Information:

Name:	Mark McCready, Co-owner and Farm Manager
E-mail:	ungle08@gmail.com (Ms. Ung)
Phone:	(410) 924-6662

Proposed Beneficial Use:

The proposed use for this withdrawal is for agriculture. Withdrawals will supply a poultry growing operation with water for cooling of chicken houses as well as for direct consumption by poultry.

Processing Dates

Processing Action	Date Occurred/Received
Pre-Application Meeting:	November 2, 2017
Application Received:	December 19, 2017
Permit Fee Deposited by Accounting:	Not Applicable
Notice of Deficiency Sent	February 22, 2018
Response to Notice of Deficiency Received:	March 19, 2018
Local Government Ordinance Form Received:	March 22, 2019
Request for Additional Information Sent:	April 18, 2018
Response to Request for Additional Information Received:	June 18, 2018
Application Complete:	June 18, 2018
Submit Request for Technical Evaluation:	December 18, 2018
Technical Evaluation Received:	February 27, 2019
Draft Permit Package Sent:	April 30, 2019
Submit Draft Permit for Public Notice:	Mo Dy, 2019
Public Notice Published:	Mo Dy, 2019
End of 30-Day Public Comment Period:	Mo Dy, 2019
Response to Public comment:	Mo Dy, 2019
Public Meeting or Hearing:	TBD

Application

Application Information

Seaside Poultry Farms is a poultry farm owned by Le Ung and Mark McCready and located in Accomack County. Seaside Poultry Farms has 8 poultry houses and 8 production wells. The houses are all 66 ft. by 600 ft. The farm produces broilers. Additional information on how water is used at the farm is discussed in the basis of need section of the fact sheet.

All eight wells were installed in the spring of 2018. The wells were installed and geophysical data was collected from the Well #1, #4, and #5 locations under the guidance of Department staff.

Location of Facility/Withdrawal:

Water Supply Planning Unit: Accomack & Northampton

County: Accomack County

GWMA/Aquifer: Eastern Shore/MiddleYorktown-Eastover and may intersect the Exmore Paleochannel

Conjunctive Use Source: This system uses no surface water and is therefore not a conjunctive use system.

Withdrawal Use, Current Need, and Projected Demand:

Basis of Need: Poultry farms use groundwater to provide drinking water to the birds as well as to supply water to either misting systems or evaporative cooling pads designed to regulate temperatures in the house and keep the birds cool. Cooling is primarily required in summer.

Water use for poultry farms varies seasonally as well as in response to the poultry life cycle. Generally during winter, fall, and spring, facility withdrawals rise and fall in a predictable pattern every 50-60 days, or the length of time it takes to raise a flock, with increased usage primarily resulting from increased water consumption as the birds gain weight. This water use pattern starts with low water consumption volumes for chick development and peaks in the last 20-30 days as growers seek to maximize adult weight gains. Typically, farms raise around five flocks per year with this cycle repeating each time. During the summer, withdrawal volumes increase due to additional water usage for flock cooling purposes.

Water volumes used for consumption are controlled by a computer system that provides water to the drinker system, which provides access to water for the birds but limits spillage or excess moisture from entering the house. Avoiding excess moisture is critical to bird health and as a result careful conservation of water is already a key tenet of management in a broiler house. The computer tracks water supplied to the drinking system and records the volume. This data was maintained by some farms but in many cases was not recorded long-term. Where available, data from the computer is discussed in the historic withdrawals section of the factsheet.

The cooling systems are operated based on temperature and humidity and while usage is typically restricted to summers, operation of the cooling systems tends to vary between farms. Historically, water supplied to the cooling systems was not metered so very limited data is available on usage.

Water Demand Projection: Water demands were based on estimated drinking and cooling water amounts needed to supply all the system houses. Proposed withdrawal limits were calculated based on the total of both consumption (drinking water) and cooling. Water use for consumption was originally calculated based upon generalized numbers provided by the primary poultry provider, Tyson, as no historical data was available; however, this data appears to have overestimated usage by using a maximum daily value instead of accounting for the cyclical and season trends associated with a poultry farm. Revised calculations were later provided based upon the "Poultry Water Use Calculation" guidance provided by DEQ and using consumption figures from nearby comparable farms as a starting point.

As no data on volumes used for cooling was available from farms operating on the shore, a procedure for estimating water use for cooling was developed for use based on discussions with industry stakeholders, individual farmers, and a review of available literature. House size and cooling fan capacity were identified as the major variables determining water use for cooling poultry houses. A formula based on 1.6 gallons per year per cubic foot per minute (cfm) of cooling fan capacity was determined to be representative for the Delmarva area poultry industry. The major variable for cooling fan capacity is the width of the house as that provides for the number and size of cooling fans that can be installed. The combined total width of the houses for the facility was used as the basis to estimate cooling water use. The water use calculations are attached to the fact sheet as Fact Sheet Attachment 3. The permit requires

metering of the wells to record total water use and actual amounts used for cooling will be collected.

A small amount of water is used for general farm operation including washing equipment and cleaning houses between flocks. An amount of 100,000 g/y was estimated for these uses.

Water demands are not expected to change as the amount requested represents the maximum capacity of the farm and no additional houses are considered in this permit. Therefore, no projections are included for this facility.

Withdrawal Volumes Requested: The applicant originally requested 21,476,800 annually and 2,802,400 monthly; however, after recalculating needs based upon the cooling calculation procedure noted above, the following withdrawal volumes were requested based upon the projected groundwater demand.

Period of Withdrawal	Actual Volume (gal.)	Volume in MGD
Maximum Monthly:	2,470,000	.080
Maximum Annual:	9,950,000	.027

DEQ Evaluation

Historic Withdrawals: No record of historic withdrawals was available for this facility as the facility was recently constructed. Refer to the DEQ Water Demand Projections section above for more information on how water use was estimated.

Analysis of Alternative Water Supplies: The Eastern Shore of Virginia is an area primarily served by groundwater with the majority of withdrawals coming from the three confined Yorktown-Eastover (Upper/Middle/Lower) aquifers. There is limited surface water availability with the majority of streams being too small to supply sufficient water for most purposes, larger water bodies are typically tidally influenced, and water quality concerns have limited the development of these sources. Withdrawals from the surficial aquifer, or water table, are one viable alternative to withdrawals from the confined system. While withdrawals from the surficial aquifer can present additional water quality challenges in the form of iron forming bacteria and increased vulnerability to surface contaminants, it may be viable in some locations where capacity and quality are sufficient. In general, drinking water for poultry must be of higher quality than the cooling water. In most cases, site-specific data will be necessary to determine the viability of the surficial aquifer and to determine what portions of the use it can supply.

Public Water Supply: The proposed withdrawal does not contain a public water supply component.

Water Supply Plan Review: A Water Supply Planner coordination request was sent on September 10, 2018 and a response was received on January 9, 2019. The response noted several key items.

The Accomack County Regional Water Supply Plan (Plan) includes irrigating agricultural facilities using both groundwater and surface water, with current permitted amounts sufficient to meet demands into 2040. The plan, however, does not include existing poultry farms in their assessments. While the seafood industry could also show future growth in the region, Section 4.0

of the ANPDC Groundwater Management Plan details industrial water for seafood and poultry processing, noting over 90% of industrial groundwater usage is related to poultry processing. WSP Staff note existing water quality concerns for surface waters and no significant water surpluses or sources in Accomack County to serve as alternative sources. Additionally, WSP staff reviewed the current alternatives under consideration, such as water table wells, and noted that the ability of the National Resources Conservation Service's (NRCS) Environmental Quality Incentives Program (EQIP) program to fund such efforts is currently unknown. The current lack of inclusion of poultry in the region's plan, existing water quality and alternative source concerns, and the unknown status of funding for alternative development underlines potential regional resource concerns to be addressed in future planning efforts.

DEQ Recommended Withdrawal Limits: The recommended withdrawal limits are based on the total of both consumption (drinking water) and cooling. Water use for consumption was evaluated based on data from a comparable farm. The consumption data from a comparable farm was provided and DEQ staff reviewed the data and determined it provided a reasonable basis for estimating monthly and annual consumption for the facility.

DEQ staff evaluated the volumes requested for cooling and determined they were accurately calculated using the procedure discussed in more detail above. Given the lack of data available for evaluating poultry water use, DEQ believes the methods employed are conservative enough to provide sufficient water for the farm to continue operation while still providing a reasonable limit for the permits. It is expected that as more metered data becomes available, withdrawal limits may be reduced in cases where actual water use is significantly lower than the permit limits.

Withdrawal limits were rounded to nearest hundred thousand in accordance with DEQ's April 6, 2015 "Rounding Memo". DEQ recommends the following withdrawal volumes based upon evaluation of the groundwater withdrawal permit application.

Period of Withdrawal	Actual Volume (gal.)	Volume in MGD
Maximum Monthly:	2,500,000	.080
Maximum Annual:	10,000,000	.274

Technical Evaluation: Aquaveo, LLC performed a technical evaluation of the application for the Department based on the VAHydroGW-ES model. As an aquifer pump test was not performed, the properties from the VAHydroGW-ES model were used to simulate the potential drawdown resulting from the proposed withdrawal. The model uses a base simulation which includes all existing permits (except the applicant wells) operating at their 2017 maximum annual withdrawal limit allowed under the terms of their permit for all Ground Water Management Area (GWMA) permit holders. This base simulation is then executed for 50 years. Due to the large simulated Middle Yorktown-Eastover aquifer horizontal conductivity of the VAHydroGW-ES cells containing the applicants wells, and given the lack of aquifer test data, a 2-D analytical simulation Hantush and Jacob, 1955) with aquifer properties from the VAHydroGW-ES model was used to simulate the potential drawdown from adding the proposed withdrawal. The second 50-year simulation for the Middle Yorktown-Eastover aquifer was conducted using a 2D Hantush-Jacob analytical simulation model with the applicant's proposed withdrawals and aquifer parameters obtained from VAHydroGW-ES to properly simulate drawdown resulting from the applicant's wells. The objectives of this evaluation were to determine the areas of any aquifers that will

experience at least one foot of water level decline due to the proposed withdrawal (the Area of Impact or AOI), to determine the potential for the proposed withdrawal to cause salt-water intrusion, and to determine if the proposed withdrawal meets the 80% drawdown criteria. A summary of the results of the evaluation are provided below and the full technical evaluation is attached to this fact sheet as Attachment 1.

Aquaveo, LLC reviewed and compared simulated 2017 water levels from the reported use to USGS measured water levels in observation wells closest to the applicant's withdrawal for the same year for the Upper, Middle, and Lower Yorktown-Eastover aquifers. Comparing the VAHydroGW-ES 2017 Historic Use Water Level with the USGS Network Well 2017 Water Level provides a method for judging the accuracy of the VAHydroGW-ES model. They noted that the water levels obtained from the regional observation networks are 3 ft. higher to 6 ft. lower for the Upper Yorktown-Eastover aquifer, 2 ft. higher to 6 ft. lower for the Middle Yorktown-Eastover aquifer, and up to 8 ft. higher to 7 ft. lower for the Lower Yorktown-Eastover aquifer. Aquaveo also noted that the observed water levels in all three aquifers exhibit yearly fluctuations in water levels of approximately 2 to 5 feet (Upper) or 2 to 10 feet (Middle and Lower). Water levels simulated by the VAHydroGW-ES do not fluctuate in the same manner because the pumping and recharge simulated in the model for any given year are averaged over the year and entered in the model as the average value for the year. Aquaveo concluded that while there are some variations between the observed and simulated water levels, the fluctuations and general patterns observed in the USGS wells are simulated by the VAHydroGW-ES model and the water levels from the two sources are in general agreement. Differences between observed and simulated water levels will be noted and addressed during the next calibration of the VAHydroGW-ES model.

The potential for adverse changes to water quality due to increases salinity resulting from the proposed withdrawal was evaluated using transient, density-dependent, SEAWAT simulations using the VAHydroGW-ES. The results indicated that no model cells simulate an increase in chloride concentration greater than 55 mg/L due to the proposed withdrawal. Therefore, the VAHydroGW-ES model results do not indicate the potential for reduced water quality.

The results of the VAHydroGW-ES and Hantush-Jacob analytical simulations predict areas of impact due to the proposed withdrawal in the Middle Yorktown-Eastover aquifer. There were no Area of Impact (AOI) noted, or no area in which the withdrawal is expected to result in a drawdown of at least 1 foot. The drawdown was less than one foot from the production center of each well in the Middle Yorktown-Eastover aquifer. The AOI does not extend beyond the property and no mitigation plan is required

With the inclusion of the proposed withdrawal, the VAHydroGW-ES model and 2D Hantush-Jacob analytical model simulated water levels at -7.4 ft. msl for the Middle Yorktown-Eastover aquifer. The 80% drawdown criterion allows the potentiometric water level (based on the critical surface elevation calculated from the VAHydroGW-ES data and Hantush-Jacob analytical model) to be reduced to -122.6 ft. msl in the Middle Yorktown-Eastover aquifer. The water levels, therefore, in the VAHydroGW-ES cell containing the applicant wells for each confined aquifer are not simulated to fall below the critical surface. Additionally, no new VAHydroGW-ES cells are simulated to have water levels below the critical surface. Therefore, this withdrawal is within the limits set by the 80% drawdown criterion.

Aquaveo, LLC concluded that the proposed withdrawals meet technical criteria for permit issuance.

Part I
Operating Conditions

Authorized Withdrawals:

Owner Well Name	DEQ Well #	Aquifer*	Type	Max Pump Setting (ft. bls)
Well 1	100-01462	Middle Yorktown-Eastover	Production	210
Well 2	100-01463	Middle Yorktown-Eastover	Production	210
Well 3	100-01464	Middle Yorktown-Eastover	Production	210
Well 4	100-01465	Middle Yorktown-Eastover	Production	210
Well 5	100-01466	Middle Yorktown-Eastover	Production	210
Well 6	100-01467	Middle Yorktown-Eastover	Production	210
Well 7	100-01468	Middle Yorktown-Eastover	Production	210
Well 8	100-01469	Middle Yorktown-Eastover	Production	210

Apportionment:

Apportionment of withdrawals is expected to be fairly equally spread across all facility wells and the permit does not include apportionment limits.

Additional Wells:

There are no additional observation, abandoned, or out of service wells associated with this facility.

Pump Intake Settings:

The pump intakes for all eight wells are documented on the GW-2 forms to be set at 150 ft. bls. which is above the 210 ft. bls. pump intake limit. All well pumps are correctly positioned in accordance with 9VAC25-610-140(A)(6**).**

Withdrawal Reporting:

Groundwater withdrawals are to be recorded monthly and reported quarterly.

Water Conservation and Management Plan:

A Water Conservation and Management Plan (WCMP) meeting the requirements of 9VAC25-610-100.B was submitted and reviewed as part of the application process. The accepted Plan is to be followed by the permittee as an operational Plan for the facility/water system.

- A detailed description of the leak detection and repair program activities and documentation to the Department that these activities have been conducted is due by the end of the first year of the

permit term (Mo Dy, 2020).

- A result of a 12 month audit of the total amount of groundwater used in the distribution system and the amounts for drinking and cooling water, documentation of the flock cycle start and end dates, and any necessary changes to the operation affecting water use is due by the end of the second year of the permit term (Mo Dy, 2021).
- A report on the plan's effectiveness in maintaining or reducing water use amounts needed, including revisions to those elements of the WCMP that can be improved and addition of other elements found to be effective based on operations to date shall be submitted by the end of years five (Mo Dy, 2024) and ten (Mo Dy, 2029) of the permit term..

Mitigation Plan:

The predicted AOI resulting from the Technical Evaluation could not be defined in the source aquifer [Middle Yorktown-Eastover] because the maximum drawdown estimated from the simulation was less than 1 ft. at each production well. A Mitigation Plan was therefore not required for the permit.

Well Tags:

Well tags will be transmitted with the final permit.

Part II
Special Conditions

Meter Installation/Verification:

In cases where meters are found to be incorrectly installed or otherwise failing to capture the total water use of each well, DEQ will notify the permittee of such via an inspection report and the permittee shall correct any meter issues within 60 days.

Part III
General Conditions

General Conditions are applied to all Groundwater Withdrawal Permits, as stated in the Groundwater Withdrawal Regulations, 9VAC25-610-10 *et seq*.

Public Comment

The following sections will be completed after close of the public comment period.

Relevant Regulatory Agency Comments:

Summary of VDH Comments and Actions: This facility is not a public water supply so soliciting comments from VDH was not required.

Public Involvement during Application Process:

Local and Area wide Planning Requirements: The Accomack County Administrator indicated on March 22, 2019that the facility's operations are consistent with all ordinances.

Public Comment/Meetings: The public notice was published in the Eastern Shore Post on Mo Dy, 2019. The public comment period ran from Mo Dy, 2019 to Mo Dy, 2019.

Changes in Permit Part II Due to Public Comments

Changes in Permit Part III Due to Public Comments

Staff Findings and Recommendations

Based on review of the permit application, staff provides the following findings.

- The proposed activity is consistent with the provisions of the Ground Water Management Act of 1992, and will protect other beneficial uses.
- The proposed permit addresses minimization of the amount of groundwater needed to provide the intended beneficial use.
- The effect of the impact will not cause or contribute to significant impairment of state waters.

Staff recommends Groundwater Withdrawal Permit Number GW0074900 be issued as proposed.

Attachments

1. **Technical Evaluation**
2. **Water Conservation Plan**
3. **Water Use Calculation Worksheet**
4. **Public Comment Sheet**

Approved: _____
Director, Office of Water Supply

Date: _____

COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

TECHNICAL EVALUATION FOR PROPOSED GROUNDWATER WITHDRAWAL

Date: December 14, 2018

Application /Permit Number: GW0074900

Owner / Applicant Name: Le Ung

Facility / System Name: Seaside Farm

Facility Type: Agriculture – Poultry Farm

Facility / System Location: Accomack County

The Commonwealth of Virginia's Groundwater Withdrawal Regulations (9VAC25-610-110(D) state that, for a permit to be issued for a new withdrawal, to expand an existing withdrawal, or reapply for a current withdrawal, a technical evaluation shall be conducted. This report documents the results of the technical evaluation conducted to meet the requirements for the issuance of a permit to withdrawal groundwater within a Groundwater Management Area as defined in (9VAC25-600-10 et seq.).

This evaluation determines the:

(1) The Area of Impact (AOI): The AOI for an aquifer is the areal extent of each aquifer where one foot or more of drawdown is predicted to occur as a result of the proposed withdrawal.
(2) Water Quality: The potential for the proposed withdrawal to cause salt water intrusion into any portions of any aquifers or the movement of waters of lower quality to areas where such movement would result in adverse impacts on existing groundwater users or the groundwater resource as per (9VAC25-610-110(D)(2), and
(3) The Eighty Percent Drawdown (80% Drawdown): The proposed withdrawal in combination with all existing lawful withdrawals will not lower water levels, in any confined aquifer that the withdrawal impacts, below a point that represents 80% of the distance between the land surface and the top of the aquifer at the points where the one-foot drawdown contour is predicted for the proposed withdrawal as per 9VAC25-610-110(D)(3)(h).

Summary of Requested Withdrawal:

General:

In response to the Department of Environmental Quality's (DEQ) Compliance Assistance Framework initiative, a cohort of poultry farms in Accomack County were identified as potentially requiring a groundwater withdrawal permit (GWWP). The farms primarily grow broilers which are processed by several poultry integrators located in the area. These farms use groundwater to provide drinking water to the birds as well as to supply water to either misting systems or evaporative cooling pads which cool the birds. Cooling is primarily required in summer. Most wells associated with poultry farms in Accomack County are screened in either the upper, middle, or lower Yorktown-Eastover aquifers. The use of the Columbia (water-table) aquifer is being investigated by the industry and this aquifer may be used in the future to augment withdrawals from confined aquifers where possible.

Water use for poultry farms varies seasonally as well as in response to the poultry life cycle. Generally during winter, fall, and spring, facility withdrawals rise and fall in a fairly predictable pattern every 50-60 days, with usage primarily resulting from water consumption. This pattern starts with low water

consumption volumes for chick development and maxes out in the last 20-30 days as breeders seek to maximize adult weight gains. Typically, farms raise around five flocks per year with this cycle repeating each time. During the summer, withdrawal volumes increase due to additional water usage for flock cooling purposes. A few farms have additional sanitary and other agricultural uses (crops/other livestock).

Facility Specific:
Seaside Farm has 8 poultry houses and 8 production wells. The houses are 66 by 600 feet. Proposed withdrawal limits were calculated based on the total of both consumption (drinking water) and cooling. Water use for consumption was calculated based on computer data from a comparable farm. Water use for cooling was calculated based on estimates based on house size and cooling fan capacity.

The proposed withdrawal limits and well construction details are as follows:

Proposed Withdrawal Limits:

Proposed Withdrawal Limits	
Annual Value	10,000,000 gallons (27,397 average gpd)
Monthly Value	2,500,000 gallons (80,645 average gpd)

Due to the well and plumbing configuration, the withdrawal will be apportioned fairly equally between the system wells.

Production Well(s):

Identification	Location	Construction	Pump Intake	Source Aquifer
Owner Well Name: Well #1 DEQ Well Number: 100-01462 MPID: 373240075475201	Lat: 37° 32' 39.959" Lon: 75° 47' 51.7051" Datum: WGS 84 Elevation: 36	Completion Date: 4-9-18 Screens (ft-bls): 220-235 Total Depth (ft-bls): 235	150	Middle Yorktown-Eastover
Owner Well Name: Well #2 DEQ Well Number: 100-01463 MPID: 373240075475302	Lat: 37° 32' 39.5956" Lon: 75° 47' 52.5452" Datum: WGS 84 Elevation: 36	Completion Date: 4-9-18 Screens (ft-bls): 215-235 Total Depth (ft-bls): 235	150	Middle Yorktown-Eastover
Owner Well Name: Well #3 DEQ Well Number: 100-01464 MPID: 373239075475303	Lat: 37° 32' 39.1099" Lon: 75° 47' 53.95" Datum: WGS 84 Elevation: 36	Completion Date: 4-10-18 Screens (ft-bls): 220-235 Total Depth (ft-bls): 235	150	Middle Yorktown-Eastover

Owner Well Name: Well #4 DEQ Well Number: 100-01465 MPID: 373239075475504	Lat: 37° 32' 38.635" Lon: 75° 47' 55.176" Datum: WGS 84 Elevation: 36	Completion Date: 4-11-18 Screens (ft-bls): 215-235 Total Depth (ft-bls): 235	150	Middle Yorktown-Eastover
Owner Well Name: Well #5 DEQ Well Number: 100-01466 MPID: 373233075474405	Lat: 37° 32' 33.4794" Lon: 75° 47' 44.4236" Datum: WGS 84 Elevation: 36	Completion Date: 4-12-18 Screens (ft-bls): 220-235 Total Depth (ft-bls): 235	150	Middle Yorktown-Eastover
Owner Well Name: Well #6 DEQ Well Number: 100-01467 MPID: 373233075474506	Lat: 37° 32' 33.0407" Lon: 75° 47' 45.1964" Datum: WGS 84 Elevation: 36	Completion Date: 4-14-18 Screens (ft-bls): 220-235 Total Depth (ft-bls): 235	150	Middle Yorktown-Eastover
Owner Well Name: Well #7 DEQ Well Number: 100-01468 MPID: 373232075474707	Lat: 37° 32' 32.2215" Lon: 75° 47' 46.6585" Datum: WGS 84 Elevation: 35	Completion Date: 4-19-18 Screens (ft-bls): 220-235 Total Depth (ft-bls): 235	150	Middle Yorktown-Eastover
Owner Well Name: Well #8 DEQ Well Number: 100-01469 MPID: 373232075474808	Lat: 37° 32' 31.7642" Lon: 75° 47' 47.5858" Datum: WGS 84 Elevation: 35	Completion Date:4-21-18 Screens (ft-bls): 220-235 Total Depth (ft-bls): 235	150	Middle Yorktown-Eastover

Geologic Setting:

The Seaside Farm wells (applicant wells) are located in southern Accomack County, likely, within the Exmore Paleochannel. The paleochannel is simulated in the VAHydroGW-ES to extend from the top of the Upper Yorktown-Eastover aquifer down to the upper portion of the Lower Yorktown-Eastover confining unit in

the vicinity of the Seaside Farm wells. The Eastern Shore paleochannels are subsurface erosional channels where all or part of the Yorktown Formation sediments have been removed and replaced by marginal-marine deposits of Pleistocene age[1]. The exact extents and depths of the paleochannels are currently being investigated by the U.S. Geological Survey (USGS). The applicant wells are screened at depths corresponding to the Middle Yorktown-Eastover aquifer and may intersect portions of that aquifer in addition to, or exclusion of, the Exmore Paleochannel. The upper portion of the Yorktown-Eastover aquifer (described in the 2006 Virginia Coastal Plain Hydrologic Framework[2] (VCPHF) as a combination of the Upper, Middle, and Lower Yorktown-Eastover aquifers) is composed primarily of estuarine to marine quartz sands of the Yorktown Formation of Pliocene age. The nearest USGS geologic cross section found in USGS Professional Paper 1731 is cross-section GS-GS' (see attached figure at the end of the report).

Virginia Eastern Shore Model data:
The following table lists the location of the applicant production wells within the Virginia Eastern Shore Model[3] (VAHydroGW-ES).

VAHydroGW-ES Model Grid				
Well	**Well Number**	**MPID**	**Row**	**Column**
Well #1	100-01462	373240075475201	204	45
Well #2	100-01463	373240075475302	204	45
Well #3	100-01464	373239075475303	204	45
Well #4	100-01465	373239075475504	204	45
Well #5	100-01466	373233075474405	204	46
Well #6	100-01467	373233075474506	204	46
Well #7	100-01468	373232075474707	204	46
Well #8	100-01469	373232075474808	204	46

Hydrologic Framework:
Data from the VCPHF is reported in this technical report to illustrate the hydrogeologic characteristics of the aquifers in the Virginia Eastern Shore near the applicant wells and identify major discrepancies between regional hydrogeology and site logs interpreted by the DEQ staff geologist.

The following average aquifer elevations were estimated from the VAHydroGW-ES at the model cell(s) containing the applicant production wells.

[1] Sanford, W.E., Pope, J.P., and Nelms, D.L., 2009, Simulation of groundwater-level and salinity changes in the Eastern Shore, Virginia: U.S. Geological Survey Scientific Investigations Report 2009–5066, 125 p.
[2] McFarland, E.R., and Bruce, T.S., 2006, The Virginia Coastal Plain Hydrogeologic Framework: U.S. Geological Survey Professional Paper 1731, 118 p., 25 pls.
[3] Sanford, W.E., Pope, J.P., and Nelms, D.L., 2009, Simulation of groundwater-level and salinity changes in the Eastern Shore, Virginia: U.S. Geological Survey Scientific Investigations Report 2009–5066, 125 p.

VAHydroGW-ES Average Hydrologic Unit Information		
Aquifer	**Elevation (feet msl)**	**Depth (feet bls)**
Surface	34	0
Columbia aquifer (bottom)	-44	78
Upper Yorktown-Eastover aquifer (top)	-111	145
Upper Yorktown-Eastover aquifer (bottom)	-150	184
Middle Yorktown-Eastover aquifer (top)	-156	190
Middle Yorktown-Eastover aquifer (bottom)	-193	227
Lower Yorktown-Eastover aquifer (top)	-231	265
Lower Yorktown-Eastover aquifer (bottom)	-302	336

Groundwater Characterization Program Recommendations:
DEQ staff geologist has reviewed available information and made the following determinations regarding the location of the aquifer tops for the following wells. Information reviewed in this process was driller's logs, geophysical logs, GW-2 form and The Virginia Coastal Plain Hydrogeologic Framework (USGS Professional Paper 1731).

Unit	Well #5
Bottom of the Columbia	70
Top of the Upper Yorktown-Eastover	138
Bottom of the Upper Yorktown-Eastover	190
Top of the Middle Yorktown-Eastover	210
Bottom of the Middle Yorktown-Eastover	267*

*Not encountered, estimated 267.

Comparison of the Hydrogeologic Framework and Groundwater Characterization Program Recommendations:
The Middle Yorktown-Eastover aquifer top elevation of -174 ft-msl/210 ft-bls provided by the DEQ staff geologist is lower than the elevation reported in the VAHydroGW-ES framework (-156 ft-msl/190 ft-bls). Local variation not captured on the regional scale of the VAHydroGW-ES are expected to occur. The VAHydroGW-ES is updated on a regular basis to reflect the most up-to-date surface elevations that are available.

Water Level Comparison:
Below water levels retrieved from the USGS regional observation network wells are compared to the simulated water levels reported in the *Virginia Eastern Shore 2017-2018 Annual Simulation of Potentiometric Groundwater Surface Elevations of Reported and Total Permitted Use* report (the 2017-2018 report) and simulation files.[4] This comparison is made in order to evaluate the performance of the regional model in the vicinity of the applicant wells and assess historical groundwater trends.

The 2017-2018 report provides two sets of simulated potentiometric water surface elevations. The VAHydroGW-ES model is divided into three parts. The first portion of the model simulates water levels within the Eastern Shore aquifers from 1900 through 2017 based upon historically reported pumping amounts (the "*Historic Use Simulation*"). This portion of the model has been calibrated to match water levels observed in USGS regional observation network wells situated throughout the peninsula. The water

[4] See *Virginia Eastern Shore 2017-2018 Annual Simulation of Potentiometric Groundwater Surface Elevations of Reported and Total Permitted Use* report and simulation files on file with the VA DEQ.

levels reported in the 2017-2018 report are based upon two separate simulations, each simulation running from 2018 through 2067. The simulated pumping amount in these two simulations are based upon, 1) the average 2013-2017 reported withdrawal amount of wells in the VAHydroGW-ES model (the "R*eported Use Simulation*") and, 2) the current (2018) maximum withdrawal amount allowed under their current permit for wells in the VAHydroGW-ES model (the "*Total Permitted Simulation*"). Both these simulations are an extension of the *Historic Use Simulation* and the water levels reported in the 2017-2018 report are the final water levels simulated at the end of the simulations (2067).

The "VAHydroGW-ES 2067 Reported Use Water Level," reported in the tables below, is the simulated water level – 50 years from present – if all permitted pumping continued at the average 2013-2017 reported withdrawal amount for the next 50 years. And the "VAHydroGW-ES 2067 Total Permitted Water Level," reported in the tables below, is the simulated water level – 50 years from present – if all Eastern Shore permitted wells were to pump at the maximum permitted amount allowed under their current permit for the next 50 years. Finally, the "VAHydroGW-ES 2017 Historic Use Water Level," reported in the tables below, is the water level simulated for the year 2017 in the *Historic Use Simulation*.

The nearest USGS regional observation network wells to the applicant wells, completed in the Upper, Middle, or Lower Yorktown-Eastover aquifers, are listed in the following tables and shown in Figure 1. For the USGS regional observation network wells, average 2017 reported water levels are shown in the following tables. Simulated water levels for the Upper, Middle, and Lower Yorktown-Eastover aquifers, for the VAHydroGW-ES cells containing the USGS regional observation network wells are also shown in the following tables.

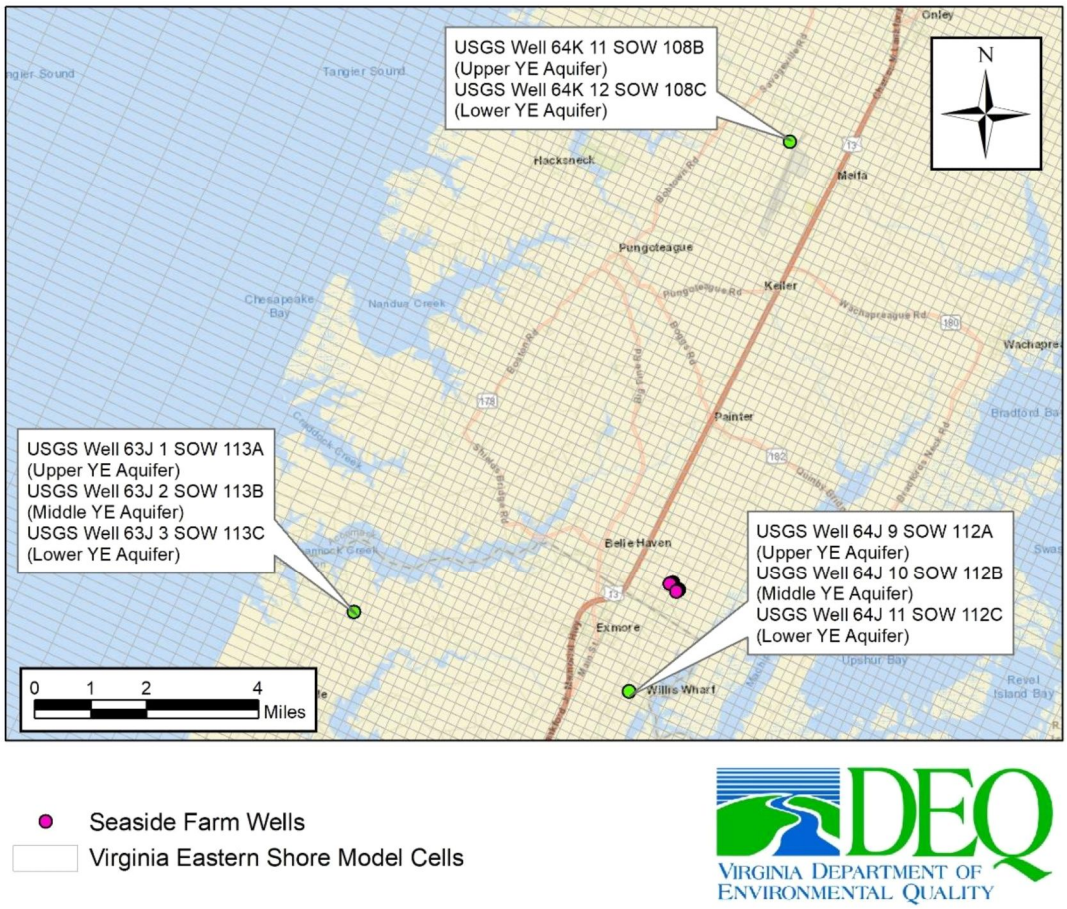

Figure 1. Nearest USGS regional observation network wells.

Comparing the VAHydroGW-ES 2017 Historic Use Water Level with the USGS Network Well 2017 Water Level provides a method for judging the accuracy of the VAHydroGW-ES. Figures 2 through 9 show graphs of the recorded water levels from the USGS observation wells listed in the following tables. These figures also show the simulated VAHydroGW-ES *Historic Use Simulation* water levels for the model cell containing each USGS well. Observing the simulated and observed water elevations together provide a second method for assessing the accuracy of the VAHydroGW-ES in the vicinity of the applicant wells.

The Upper Yorktown-Eastover VAHydroGW-ES 2017 Reported Use Water Levels are 3 feet higher to 6 feet lower than the USGS Network Well 2017 Water Levels observed in Well 64J 9 SOW 112A, Well 63J 1 SOW 113A, and Well 64K 11 SOW 108B. The water levels observed over the past approximately 40 years in each Upper Yorktown-Eastover USGS well are shown in Figures 2 through 4. The wells exhibit yearly fluctuations in water levels of approximately 2 to 5 feet. Water levels simulated by the VAHydroGW-ES do not fluctuate in the same manner because the pumping and recharge simulated in the model for any given year are averaged over the year and entered in the model as the average value for the year. Water levels for the USGS Upper Yorktown-Eastover wells are in general agreement with the water levels simulated by the VAHydroGW-ES – especially for Well 63J 1 SOW 113A. While still reasonably accurate, water levels are approximately 5 feet higher for Well 64J 9 SOW 112A and for Well 64K 11 SOW 108B, over the past four decades, when compared to those simulated by the VAHydroGW-ES.

The Middle Yorktown-Eastover VAHydroGW-ES 2017 Reported Use Water Levels are 2 feet higher to 6 feet lower than the USGS Network Well 2017 Water Levels observed in Well 64J 10 SOW 112B and Well 63J 2 SOW 113B. The water levels observed over the past 40 years in the Middle Yorktown-Eastover USGS wells are shown in Figures 5 and 6. Each well exhibits yearly fluctuations in water levels of approximately 2 to 10 feet. Water levels for the USGS Middle Yorktown-Eastover wells are in general agreement with the water levels simulated by the VAHydroGW-ES – especially for Well 63J 2 SOW 113B. The fluctuations and general patterns observed in Well 64J 10 SOW 112B are generally simulated by the VAHydroGW-ES, with water levels for Well 64J 10 SOW 112B higher by approximately 5 feet than those simulated by the VAHydroGW-ES over the past 40 years.

The Lower Yorktown-Eastover VAHydroGW-ES 2017 Reported Use Water Level is approximately 7 feet lower than the USGS Network Well 2017 Water Level observed in Well 64J 11 SOW 112C; the VAHydroGW-ES 2017 value for USGS 63J 3 SOW 113C is approximately 4 feet higher; and the 2017 VAHydroGW-ES water level is approximately 8 feet higher than the level observed in Well 64K 12 SOW 108C. The water levels observed over the past 40 years in the Lower Yorktown-Eastover USGS wells are shown in Figures 7 through 9. Each well exhibits yearly fluctuations in water levels of approximately 2 to 10 feet. Water levels for the USGS Lower Yorktown-Eastover wells are in general agreement with the water levels simulated by the VAHydroGW-ES. The fluctuations and general patterns observed in Well 64J 11 SOW 112C and Well 63J 2 SOW 113C are generally simulated by the VAHydroGW-ES. Water levels simulated by the VAHydroGW-ES are also in general agreement with those observed in Well 64K 21 SOW 108C – though the observed water levels do decline at a larger rate than those simulated.

Differences between observed and simulated water levels will be noted and addressed during the next calibration of the VAHydroGW-ES.

Upper Yorktown-Eastover Measurements	64J 9 SOW 112A	63J 1 SOW 113A	64K 11 SOW 108B
Distance from applicant wells (miles)	2.1	5.7	8.3
VAHydroGW-ES Row	215	219	161
VAHydroGW-ES Column	46	19	38
VAHydroGW-ES Land Surface Elevation (ft-msl)	21	21	44
USGS Well Land Surface Elevation (ft-msl)	30	22	47
USGS Network Well 2017 Water Level (ft-msl)	6.1	-2.1	33.5
VAHydroGW-ES 2017 Reported Use Water Level (ft-msl)	-0.2	0.8	29.4
VAHydroGW-ES 2067 Reported Use Water Level (ft-msl)	-0.4	-2	29.3
VAHydroGW-ES 2067 Total Permitted Water Level (ft-msl)	-6.7	-9.1	28.3

Middle Yorktown-Eastover Measurements	64J 10 SOW 112B	63J 2 SOW 113B
Distance from applicant wells (miles)	2.1	5.7
VAHydroGW-ES Row	215	219
VAHydroGW-ES Column	46	19
VAHydroGW-ES Land Surface Elevation (ft-msl)	21	21
Land Surface Elevation (ft-msl)	30	22
USGS Network Well 2017 Water Level (ft-msl)	6.3	-1.5
VAHydroGW-ES 2017 Reported Use Water Level (ft-msl)	-0.2	0.7
VAHydroGW-ES 2067 Reported Use Water Level (ft-msl)	-0.4	-2
VAHydroGW-ES 2067 Total Permitted Water Level (ft-msl)	-6.7	-9.1

Lower Yorktown-Eastover Measurements	64J 11 SOW 112C	63J 3 SOW 113C	64K 12 SOW 108C
Distance from applicant wells (miles)	2.1	5.7	8.3
VAHydroGW-ES Row	215	219	161
VAHydroGW-ES Column	46	19	38
VAHydroGW-ES Land Surface Elevation (ft-msl)	21	21	44
Land Surface Elevation (ft-msl)	30	22	47
USGS Network Well 2017 Water Level (ft-msl)	6.9	-3.3	12.9
VAHydroGW-ES 2017 Reported Use Water Level (ft-msl)	-0.1	0.4	20.8
VAHydroGW-ES 2067 Reported Use Water Level (ft-msl)	-0.3	-2.3	20.6
VAHydroGW-ES 2067 Total Permitted Water Level (ft-msl)	-6.6	-9.4	18.9

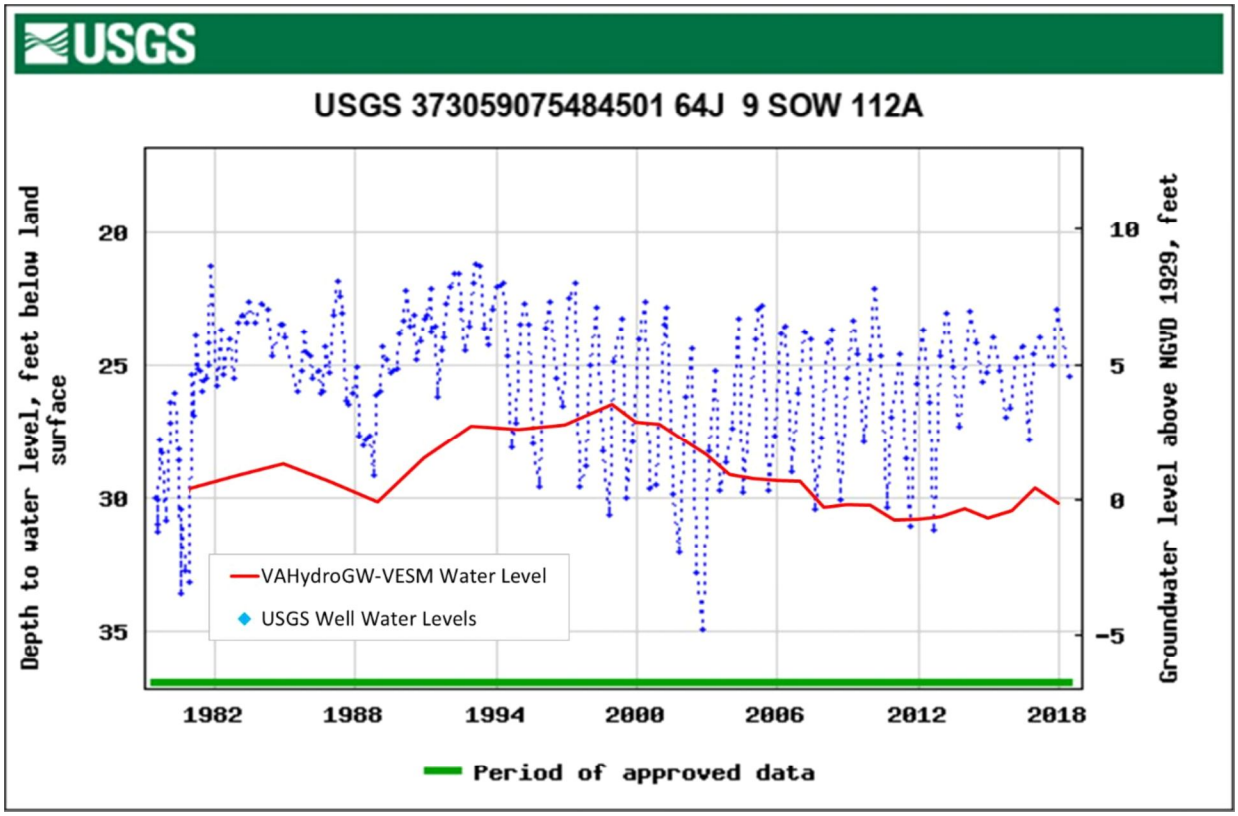

Figure 2. USGS Regional Observation Well 64J 9 SOW 112A, Upper Yorktown-Eastover aquifer water levels recorded from 1979 to present (well depth 135 ft bls, land surface 30 ft msl).

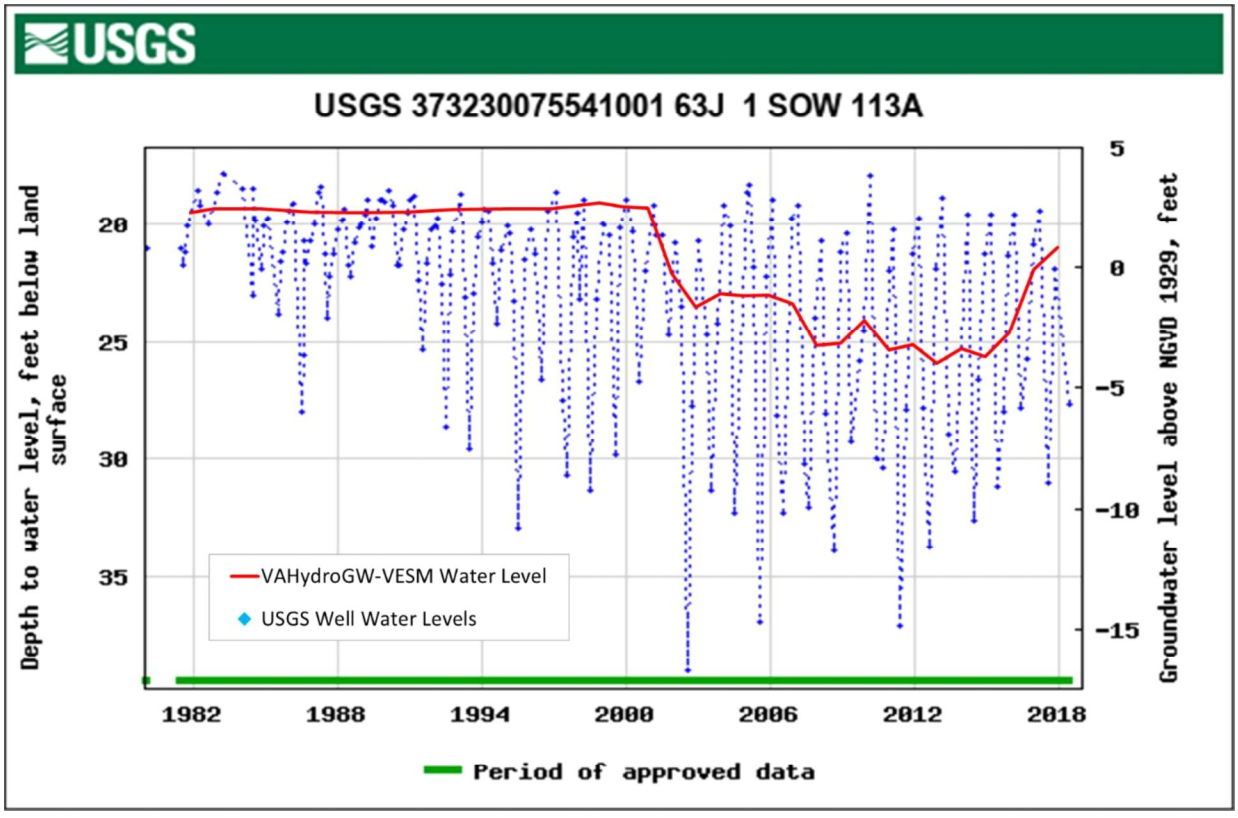

Figure 3. USGS Regional Observation Well 63J 1 SOW 113A, Upper Yorktown-Eastover aquifer water levels recorded from 1980 to present (well depth 120 ft bls, land surface 22 ft msl).

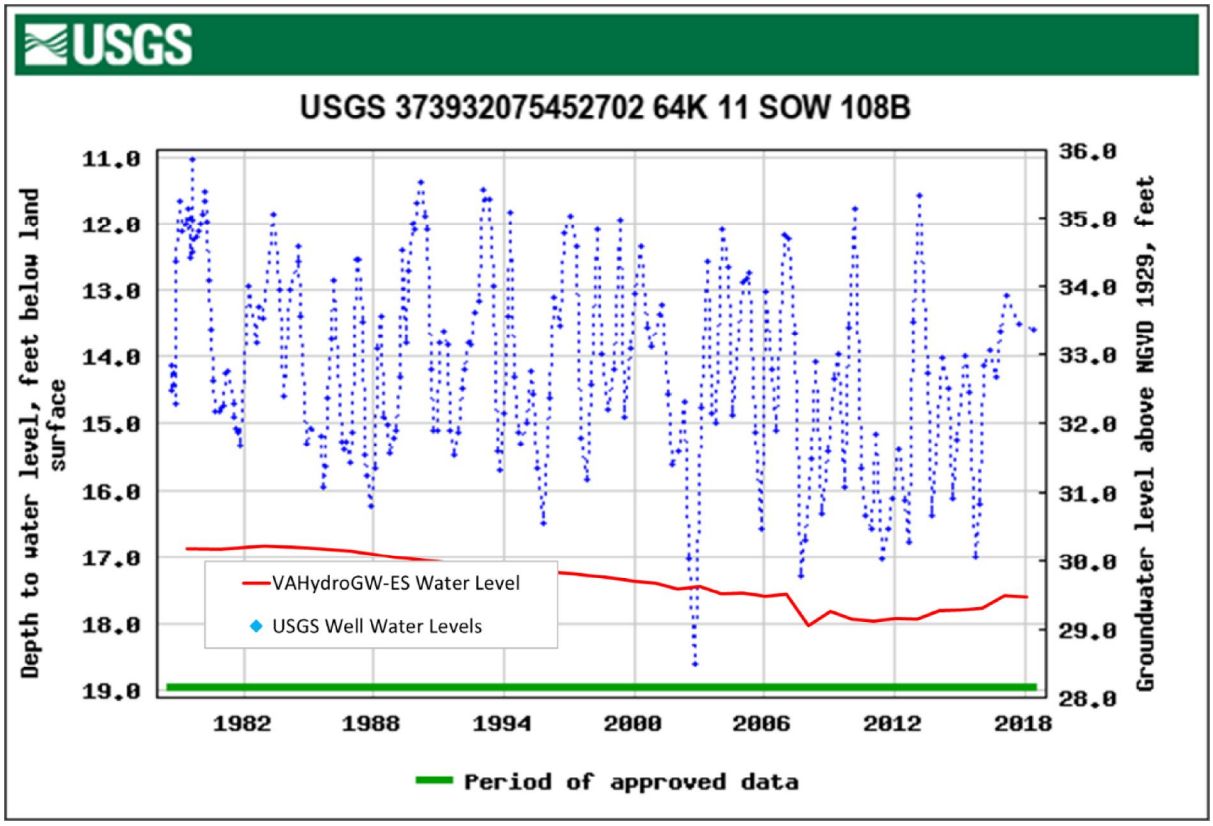

Figure 4. USGS Regional Observation Well 64K 11 SOW 108B, Upper Yorktown-Eastover aquifer water levels recorded from 1978 to present (well depth 180 ft bls, land surface 47 ft msl).

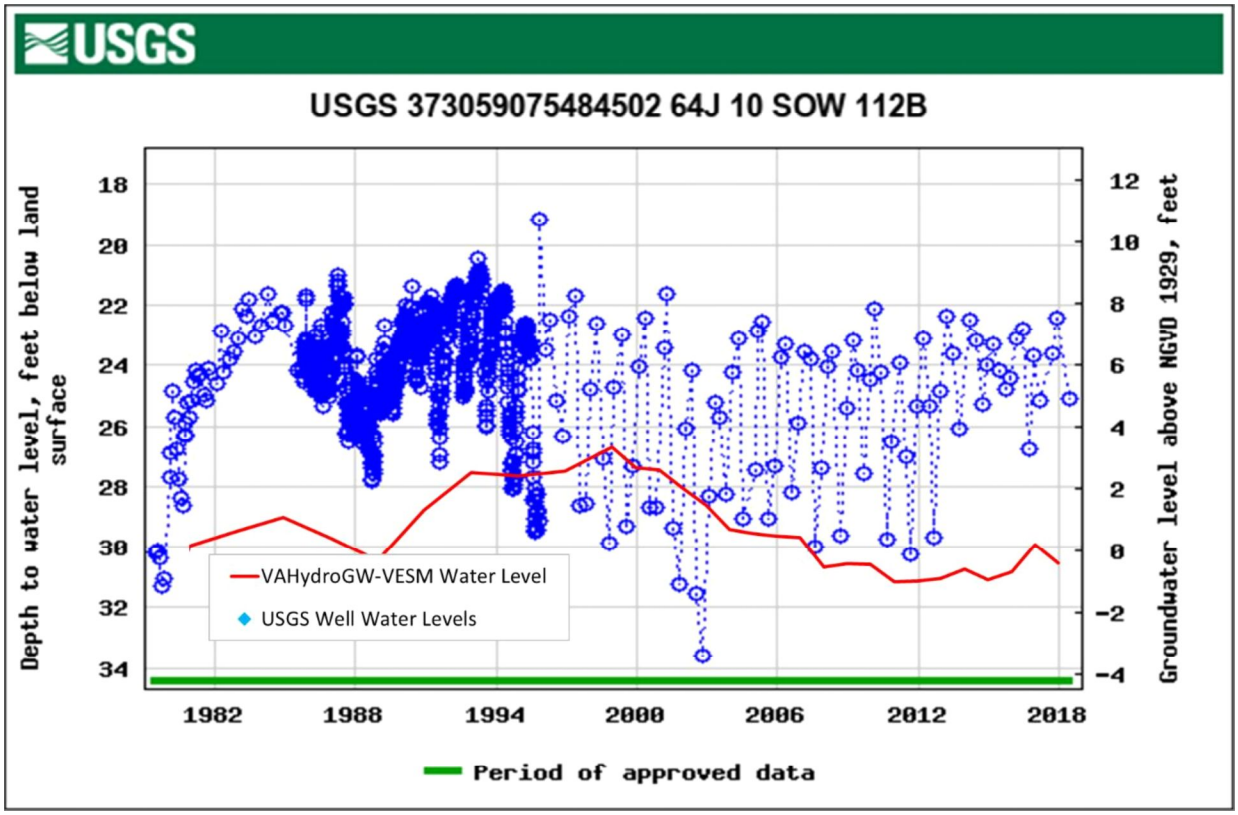

Figure 5. USGS Regional Observation Well 64J 10 SOW 112B, Middle Yorktown-Eastover aquifer water levels recorded from 1979 to present (well depth 210 ft bls, land surface 30 ft msl).

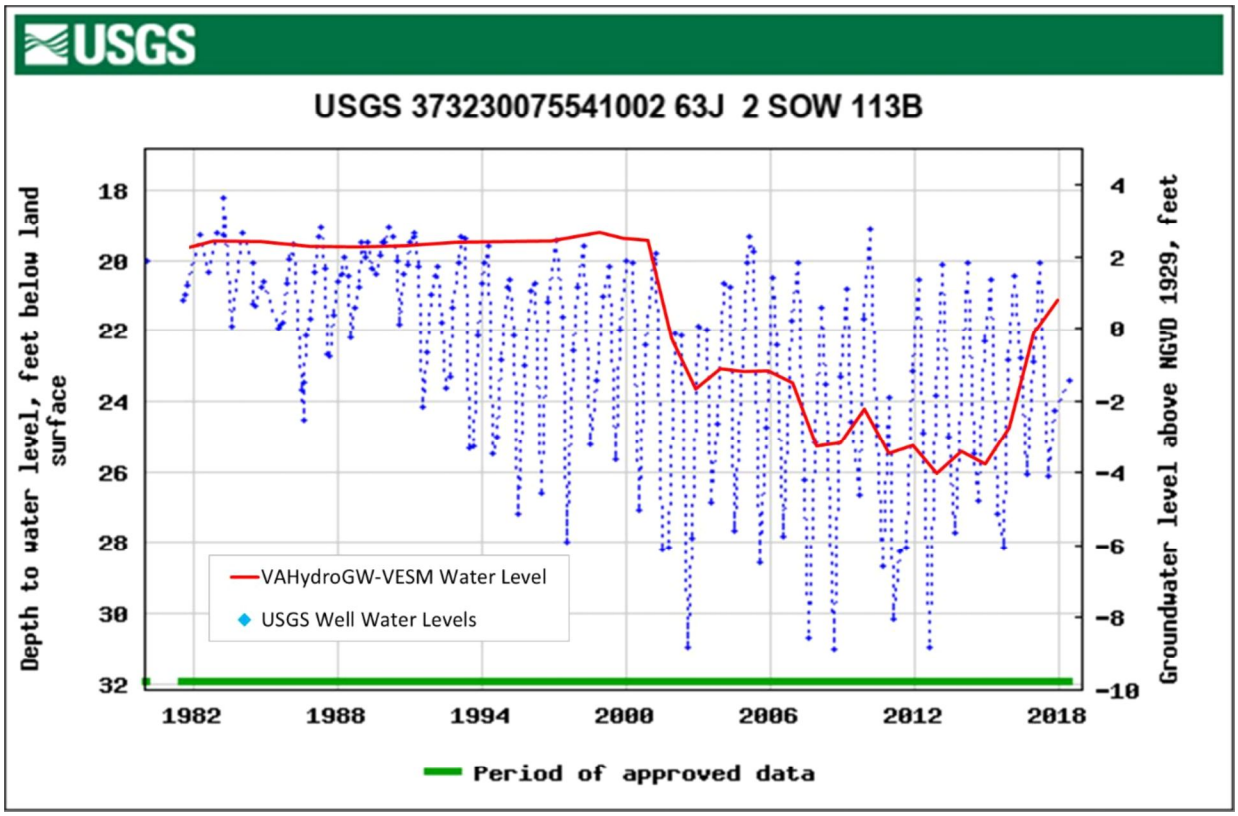

Figure 6. USGS Regional Observation Well 63J 2 SOW 113B, Middle Yorktown-Eastover aquifer water levels recorded from 1980 to present (well depth 225 ft bls, land surface 22 ft msl).

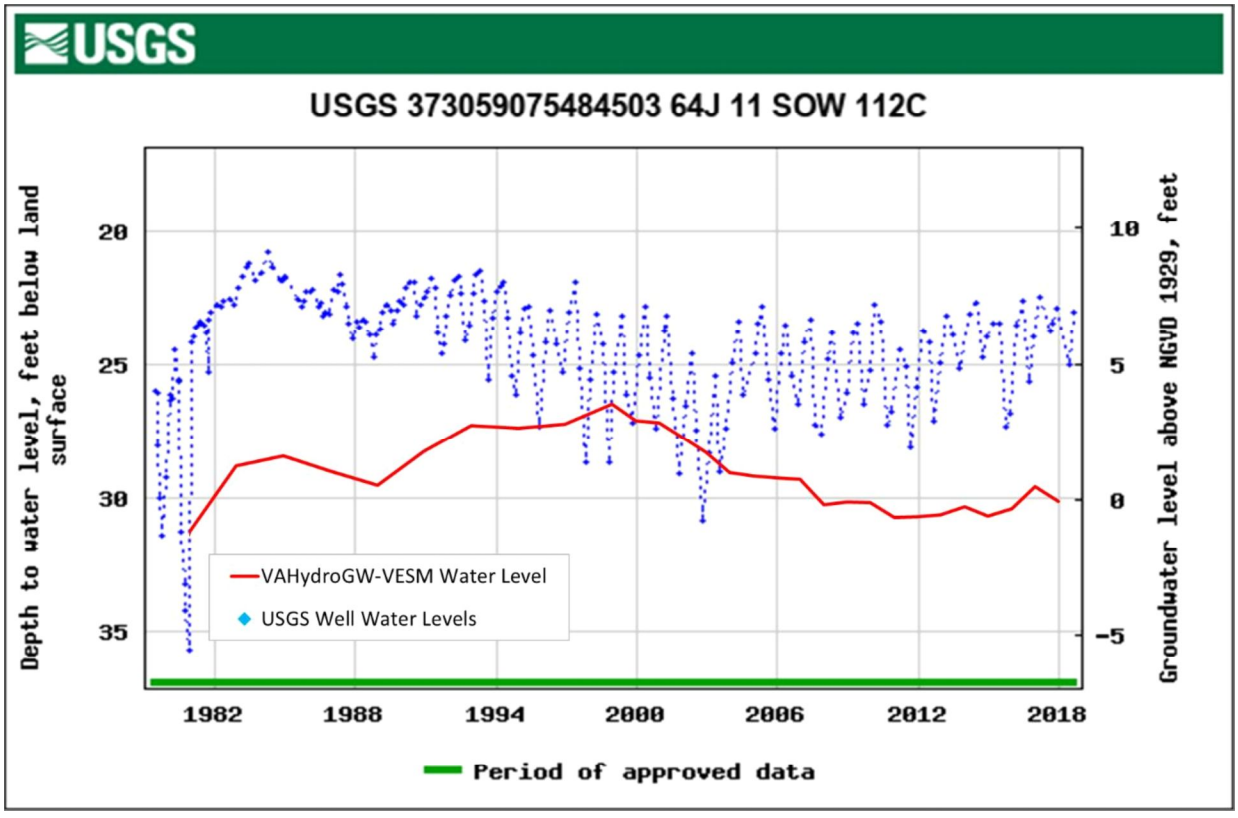

Figure 7. USGS Regional Observation Well 64J 11 SOW 112C, Lower Yorktown-Eastover aquifer water levels recorded from 1979 to present (well depth 313 ft bls, land surface 30 ft msl).

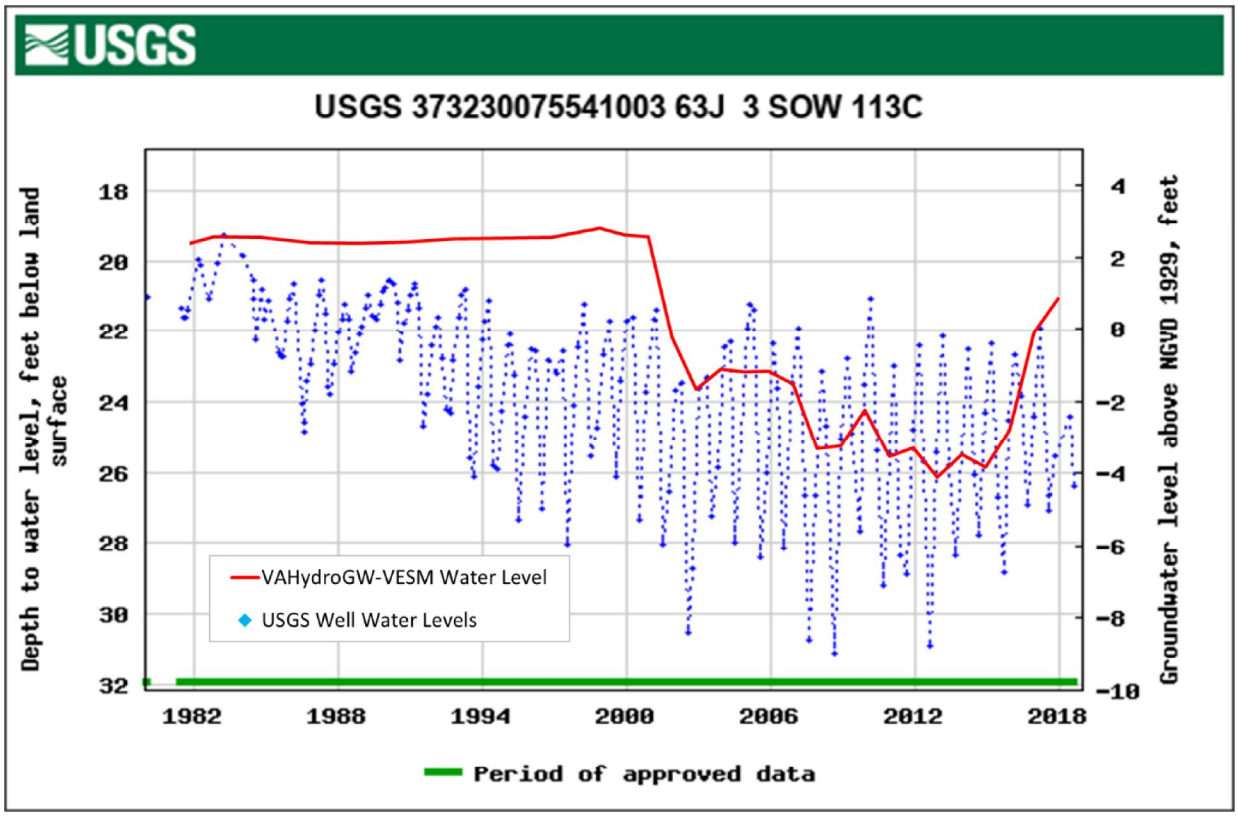

Figure 8. USGS Regional Observation Well 63J 2 SOW 113C, Lower Yorktown-Eastover aquifer water levels recorded from 1980 to present (well depth 290 ft bls, land surface 22 ft msl).

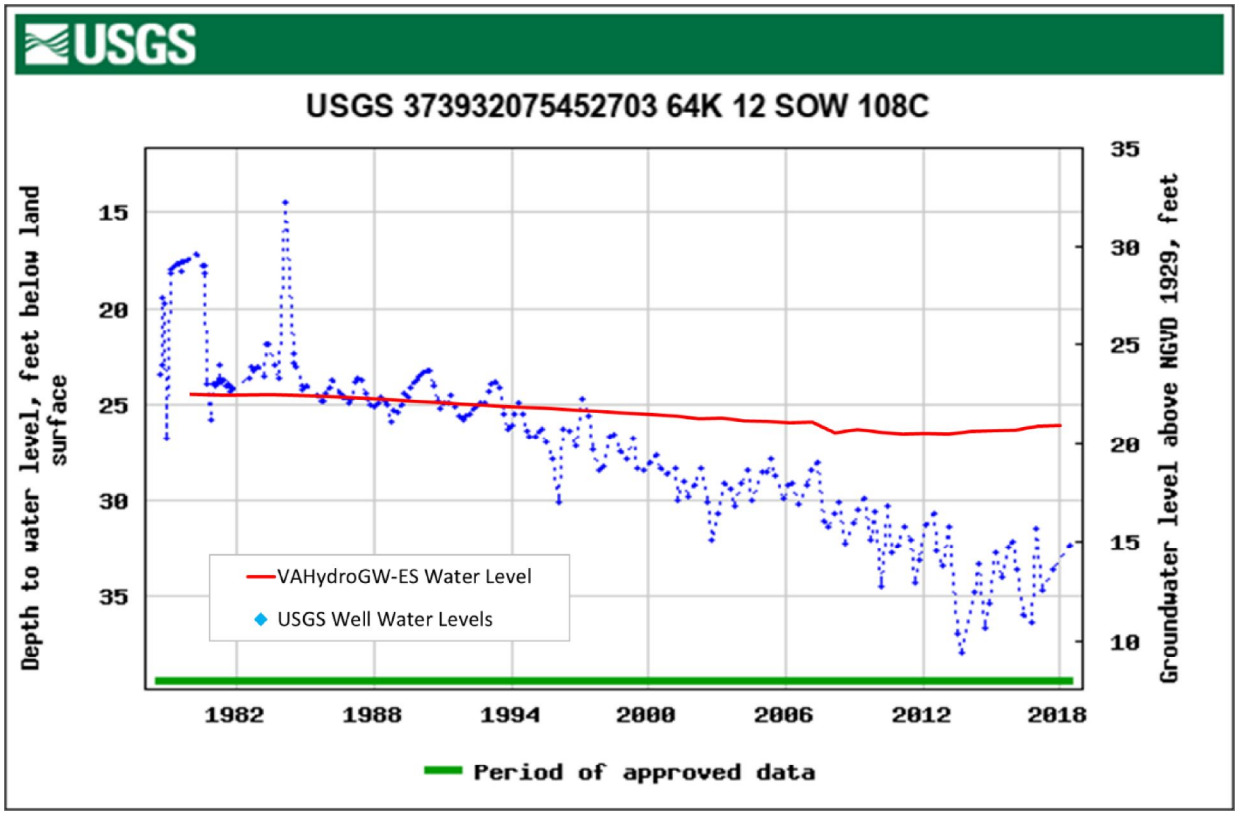

Figure 9. USGS Regional Observation Well 64K 21 SOW 108C, Lower Yorktown-Eastover aquifer water levels recorded from 1978 to present (well depth 284 ft bls, land surface 47 ft msl).

Aquifer Test(s):
An aquifer test has not been conducted for this system and the VAHydroGW-ES model, or model parameters, will be used to evaluate the application. The following table provides the average hydrogeologic properties assigned to the VAHydroGW-ES cell(s) containing the applicant wells.

Virginia Eastern Shore Model Hydrogeologic Properties: Row 204/Column 45&46							
Aquifer	**Top Elevation (feet msl)**	**Top Elevation (feet bls)**	**Aquifer Thickness (feet)**	**Horizontal Conductivity (feet/day)**	**Vertical Conductivity (feet/day)**	**Specific Storage (1/feet)**	**Specific Yield**
Columbia	34	0	78	43	0.5	0.00001	0.15
Upper Yorktown-Eastover	-111	145	39	100	25.0	0.000004	N/A
Middle Yorktown-Eastover	-156	190	37	100	25.0	0.000004	N/A
Lower Yorktown-Eastover	-231	265	71	14	18.8	0.000004	N/A

Model Results

Evaluation of Withdrawal Impacts:
Due to the large simulated Middle Yorktown-Eastover aquifer horizontal conductivity of the VAHydroGW-ES cells containing the applicant wells, and because an aquifer pump test was not performed, a 2-D analytical simulation was used to simulate the potential drawdown resulting from the proposed withdrawal. Properties from the VAHydroGW-ES were used as aquifer properties in the 2-D simulation. The drawdown in the Middle Yorktown-Eastover aquifer resulting from the proposed withdrawal was calculated using a Hantush and Jacob (1955) 2-D analytical simulation. The Hantush and Jacob simulation simulates drawdown in a leaky aquifer assuming constant discharge from a fully penetrating well and most closely simulates the aquifer properties observed in the Eastern Shore area. The Middle Yorktown-Eastover aquifer hydraulic conductivity and specific storage were multiplied by the VAHydroGW-ES aquifer thickness (37 feet) to obtain the aquifer transmissivity and storage coefficient used to simulate drawdown. The average Middle Yorktown-Eastover confining unit thickness and vertical hydraulic conductivity values for the cells containing the applicant wells are 6 feet and 25 ft/day, respectively. These values were used to calculate a Middle Yorktown-Eastover inverse leakage factor (1/B). For the 2-D analytical simulations the following parameters were used:

Middle Yorktown-Eastover Aquifer Model Input Parameters: (Hantush and Jacob 1955 solution based on aquifer parameters obtained from the VAHydroGW-ES)
Transmissivity = 3,700 ft^2/day
Storage Coefficient = 1.48 x 10^{-4}
1/B = 3.36 x 10^{-2} ft^{-1}

Withdrawal rate/Simulation Time: 50 years at a rate of 10,000,000 gallons per year (27,397 average gpd) from the Middle Yorktown-Eastover aquifer. The full withdrawal rate was assigned to each well in a separate simulation.

Model Results - Area of Impact:
The AOI for an aquifer is the area where the additional drawdown due to the proposed withdrawal exceeds one foot. The Hantush-Jacob analytical simulation, with the parameters outlined above, simulates drawdown in the Middle Yorktown-Eastover aquifer of less than one foot at each production well.

80 % Drawdown:
The 80% drawdown criterion was evaluated using the VAHydroGW-ES and the Hantush-Jacob analytical simulation. A base simulation was developed to predict the impacts from all existing permits (except the applicant wells) operating at their 2017 maximum annual withdrawal limit allowed under the terms of their permit for all Ground Water Management Area (GWMA) permit holders. The base simulation used the 2018 Total Permitted pumping rates and 2017 simulated Reported Use water levels as starting conditions. The base simulation was executed for 50 years. A second simulation was conducted using the 2D Hantush-Jacob analytical simulation to simulate drawdown resulting from the applicant wells using the parameters and withdrawal rate listed above in the *Model Input Parameters* section of this report. For the baseline simulation, the Middle Yorktown-Eastover aquifer VAHydroGW-ES cells containing the applicant wells simulated an average potentiometric water surface of -6.6 ft-msl. The analytical simulation simulated a maximum drawdown of 0.8 feet.

Subtracting the maximum drawdown simulated in the analytical simulation from the simulated water level in the baseline VAHydroGW-ES simulation at the cells containing the applicant wells results in a simulated water level of -7.4 ft-msl for the Middle Yorktown-Eastover aquifer. This approach for simulating the potentiometric surface elevation is the most conservative for the resource. The elevation of the Middle Yorktown-Eastover aquifer top at the VAHydroGW-ES row 204/column 45 is -156 ft-msl. The 80% drawdown requirement allows the potentiometric surface (based on the critical surface elevation calculated from the VAHydroGW-ES data) to be reduced to -122.6 ft-msl in the Middle Yorktown-Eastover aquifer at the cell nodes nearest the applicant wells. Therefore, the water level in the source aquifer is not simulated to fall below the critical surface.

Additionally, no new VAHydroGW-ES cells are simulated to have water levels fall below the critical surface. Therefore, this withdrawal is within the limits set by the 80% drawdown criterion.

The requested withdrawal is allocated 100% to the Middle Yorktown-Eastover aquifer. The technical evaluation analysis indicated that the apportionment of the requested withdrawal amount among the applicant production wells had no significant effect on the outcome of the technical evaluation.

Water Quality:
The EPA has established the National Secondary Drinking Water Regulations (NSDWRs) which are non-enforceable guidelines regulating contaminants that may cause cosmetic or aesthetic (such as taste, odor, or color) effects in drinking water. The EPA recommends the secondary standards to water systems – states may choose to adopt them as enforceable standards. The EPA NSDWRs specify the limit on chloride as 250 mg/L.

The VAHydroGW-ES was created "to help the Commonwealth and local water managers better plan water use and estimate future changes in water and salinity levels in response to changes in water use."[5] Use of the model to predict future chloride concentrations results in a "general useful understanding of system behavior, but water-resource managers must be careful in trusting the accuracy of predictions at individual wells from a regional model."[6] Further, chloride concentrations at individual wells, predicted using the regional model, should not be relied upon to predict actual concentrations at those locations.

[5] Sanford, W.E., Pope, J.P., and Nelms, D.L., 2009, Simulation of groundwater-level and salinity changes in the Eastern Shore, Virginia: U.S. Geological Survey Scientific Investigations Report 2009–5066, 125 p.
[6] Sanford, W.E. and Pope, J.P., 2009, Current challenges using models to forecast seawater intrusion: lessons from the Eastern Shore of Virginia, USA. Hydrogeology Journal (2009), Volume: 18, Issue: 1, p: 73-93

The potential for adverse changes to water quality due to the requested withdrawal was evaluated using transient, density-dependent, SEAWAT simulations using the VAHydroGW-ES. Two simulations were executed – one simulation without the proposed withdrawal included and a second with the proposed withdrawal included. Both simulations were executed for 50 years. And both used the 2017 total permitted stresses, concentrations, and heads as starting conditions. In an effort to simulate the long-term effects on water quality due to the proposed withdrawal, the annual amount of 2,300,000 gallons per year (6,301 average gpd) was used for the duration of the second simulation. The two simulations were compared to evaluate the potential for adverse changes to water quality. The results indicated that no model cells simulate an increase in chloride concentration greater than 55 mg/L due to the proposed withdrawal. Therefore, the VAHydroGW-ES model results do not indicate the potential for reduced water quality as a result of the proposed withdrawal.

Conclusion:
The withdrawal requested by Le Ung for the Seaside Farm withdrawal satisfies the technical evaluation criteria for permit issuance. Simulated drawdown was less than one foot; therefore, no AOI was produced.

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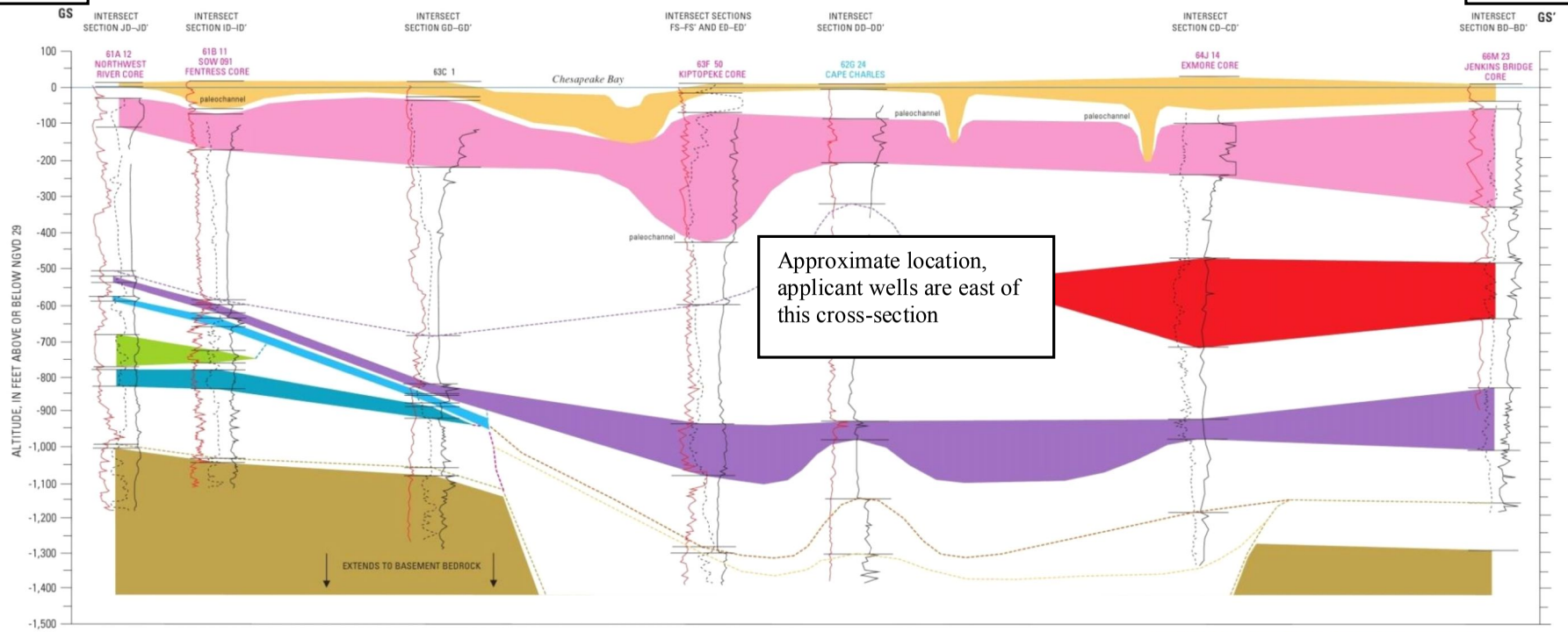
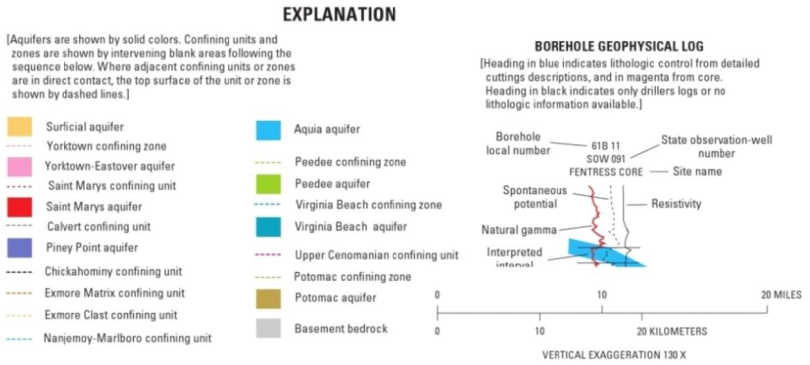
SOUTH

NORTH





Reference location of cross-section above

Coastal Plain (2006) Cross-Sections GS-GS' from USGS Professional Paper 1731.

Introduction

Seaside Farm is a contract broiler farm that produces chicken for meat production. The facility consists of 6 chicken houses in the town of Belle Haven in Accomack County, Virginia. Seaside Farm fully understands the need to be a good steward of the region's limited groundwater resources. As a result, key operational and design considerations were made to minimize the use and loss of water in Seaside Farm Water Supply System.

This Water Conservation and Management Plan is designed to optimize Seaside Farm's groundwater supply and consists of the following elements:

- Practicable Water-Saving Equipment and Processes
- Water Loss Reduction Program
- Water Use Education Program
- Evaluation of Practicable Water Reuse Options
- Mandatory Water Use Reductions during Shortages.

Practicable Water-Saving Equipment and Processes

Seaside Farm's requirements for water-saving equipment and processes are implemented primarily through the construction and maintenance of the most water efficient poultry houses. Drinker systems for all facilities are designed to provide clean, cool water with adequate flow rate fundamental to food poultry production. The use of closed nipple drinker systems ensures minimal waste of water and precludes the requirement for daily cleaning, which also conserves overall water usage. Flow rates are regularly checked and water consumption is monitored daily with any substantial change in water usage investigated. Evaporative Cooling Pads are utilized only at temperatures above 82° F and recirculate water until evaporated in order to conserve water while still meeting their designed purpose of providing temperature relief in conditions too warm for efficient food poultry production. Management techniques that do not involve water consumption are also utilized in hot conditions such as walking the birds and feed removal.

Seaside Farm has implemented comprehensive water conservation measures for appliances and plumbing fixtures in new construction and renovations in accordance with the Virginia Uniform Statewide Building Code (USBC), which includes the Virginia Plumbing Code. Seaside Farm has also fully adopted the optional provisions in USBC Volume II, Building Maintenance Code, applicable to rehabilitation of existing buildings. These codes require the use of low-flow fixtures (e.g., shower heads, toilets, and faucets) and other water-saving measures for homes and commercial buildings. The Farm generally maintains 50 to 65 pounds per square inch in the distribution system for all 6 poultry houses. This pressure is adequate for raising the broiler chickens but reduces the flows from faucets and other plumbing fixtures.

The facility has a vested financial interest in saving water. This is because water use at this facility requires electricity to run the well pump; storage tank float switch; booster pumps; etc. Furthermore, water use contributes to both booster and well pump wear and eventual failure. Because electricity and failing appurtenances cost the facility money, staff is

consistently mindful and proactive when it comes to unintentional water use at the facility. Additionally, water use issues are indicative of flock problems and are resolved quickly to ensure maximum flock survival. Management at Seaside Farm will regularly review water consumption electronically and will implement changes when opportunities are identified.

Water Loss Reduction Program

Water Loss Audit

Seaside Farm will initiate a water audit within the first two years of the permit term. The audit will include an evaluation of the well pumpage and bird consumption as well as evaporative cooling pad usage to determine unaccounted for water. Should this audit demonstrate the need for Chicken House specific leak detection program, it will be initiated accordingly.

Leak Detection and Repair from Distribution System

Water piping on the Farm is relatively new (installed within the last 2 years), is generally shallow (typically three feet of cover) and in many cases on the surface. As a result, water distribution system leaks of any significance typically come to the surface immediately and are easily located for prompt repair. The Farm's inspection program includes routine operations and special inspections. Routine inspections consist of observation of the well piping and equipment in the course of daily operations.

Leak Detection and Repair for Individual Chicken Houses

Significant leaks in individual chicken houses lead to substantial problems in maintaining flock survival rates. For this reason, leaks are quickly found and repaired. Farm staff works closely with Management to identify and resolve leaks when higher than normal water consumption is identified on the house controller.

Water Use Education Program

Employee Training

All employees on the Seaside Farm are encouraged to conserve water and identify potential leaks when hired, during training, and the use of regular conversational reminders. Specifically, employees are instructed in the ways in which they could use less water (or no water) for a given task, for example:

1) Use fixed volume containers for cleaning.
2) Never leaving water running unattended.
3) Use of waterless hand sanitizer instead of washing hands with water, when practical.

Evaluation of Practicable Water Reuse Options

Seaside Farm has limited opportunities to explore water reuse projects for Seaside Farm because there is no wastewater generated as a result of the withdrawal. The likelihood of a reuse project occurring is remote at this time, given the current water saving equipment in place and inability to practicably treat collected storm water to potable standards for food poultry production. Should a water use arise that could utilize non-potable water, then a Water Re-use Evaluation will be conducted, at that time.

Mandatory Water Use Reductions during Shortages

The facility will comply with all applicable sections of the Accomack County Drought Response and Contingency Plan as identified in the Accomack County Water Supply Plan. This includes voluntary water use restrictions in drought watch and mandatory water use restrictions in a drought emergency. Personnel and visitors will be instructed to conserve water and advised of any water use restrictions that may be in place and that the waste of water generally will not be permitted for the duration of a water shortage emergency.

Mark McCready
Seaside Farm
Accomack County, VA
Groundwater Withdrawal Permit Application

Facility Information

6 poultry houses, 66 foot width

Consumption

See metered data for one house on one flock.

Assuming that water consumption remains generally constant from flock to flock.

$$Annual\ Flock\ Consumption = 128{,}317\ \frac{gal}{house} \times 8\ houses\ X\ 5\ \frac{flock}{yr} = 5{,}132{,}680\ \frac{gal}{yr}$$

$$Max\ Monthly\ Flock\ Consumption = \sum_{Day\ 50}^{Day\ 20} Daily\ Water\ Consumption = 864{,}000\ \frac{gal}{mo}$$

Cooling

See Figure 12 of University of Georgia, Poultry Housing Tips (Evaporative Cooling Pad System Water Usage), Volume 29, Number 1, 2017, for evaporative cooling pad water usage per tunnel fan capacity.

$$Annual\ Cooling\ (Easton, MD) \approx \frac{160{,}000\ \frac{gal}{yr}}{100{,}000\ cfm} \approx \frac{1.6\ \frac{gal}{yr}}{1\ cfm}$$

See Page 6 of Cobb-Vantress, Broiler Management Guide, November 15, 2013, for tunnel fan capacity (operating at an airspeed of 600 fpm) versus house width.

$$Tunnel\ Fan\ Capacity = \left[376{,}200 \frac{cfm}{hse} \times 8\ hse\right] = 3{,}009{,}600\ cfm$$

$$Annual\ Cooling = 2{,}257{,}200\ cfm \times \frac{1.6\ \frac{gal}{yr}}{1\ cfm} = 4{,}815{,}360\ \frac{gal}{yr}$$

Requested Withdrawal Amounts

$$Annual\ Amount = 5{,}132{,}680\ \frac{gal}{yr} + 4{,}815{,}360\ \frac{gal}{yr} = 9{,}948{,}040\ \frac{gal}{yr} \approx 9{,}950{,}000\ \frac{gal}{yr}$$

$$Monthly\ Amount = 864{,}000\ \frac{gal}{mo} + \left[\frac{4{,}815{,}360\ \frac{gal}{yr}}{3}\right] = 2{,}469{,}120\ \frac{gal}{mo} \approx 2{,}470{,}000\ \frac{gal}{mo}$$